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THE ISTHMUS OF DARIEN.

(*Surveys of Lieut. Lucien N. B. Wise.*)

THE interest in the Darien Isthmus now rests on the question of a ship canal between the two oceans; but the attention of those who, in studying that important question, read the history of the isthmus, cannot fail to be arrested by the romantic adventures of its early explorers. The engineers who run surveys across between the Gulfs of Darien and San Miguel are on the very route which was made memorable by Vasco Nuñez de Balboa when he marched over it to discover the South Sea in 1513. That Isthmus of Darien, which is now so little known, was traversed in all directions by the adventurous explorers of the sixteenth century, by Vasco Nuñez and Morales, by Meneses and Espinosa, by Pedrarias and Andagoya. Here too were the scenes of the romantic exploits of Drake and Oxenham, of Wafer and Dampier, and of the ill-fated Scottish colony, the history of which has been so well told by Elliot Warburton.

The exploring surveys of Lucien N. B. Wyse during 1876 and 1877 (noticed in previous numbers*) have again brought the Darien Isthmus prominently to the notice of geographers; and that officer has given a detailed account of his proceedings in the *Bulletin de la Société de Geographie* for last December.

The Isthmus of Darien is comprised between 7° 30′ and 9° 30′ N. latitude, and is separated from that of Panama by the mountains of San Blas. It is traversed by a cordillera which keeps nearer to the Atlantic than to the Pacific shore, so that there are no important rivers on the Atlantic slope. Three great arteries receive most of the water which falls so abundantly over this region, the rivers Bayano, Chucunaque and Tuyra, the two latter uniting and falling into the Gulf of San Miguel, after forming a great estuary which supplies a superb land-locked harbour. There are no traces of recent volcanic action on the isthmus, and borings that have been made, have not resulted in the discovery of crystalline rocks. A communication has evidently existed between the two oceans at a recent geological period, but the epoch cannot be fixed owing to the paucity of fossils. The coasts, especially on the Atlantic side, are lined with coral reefs; and the plains are formed of clay-sandy alluvium, while higher up a schistose rock crops out, with sandstone and a calcareous conglomerate. Iron, copper, silver, and gold abound, especially in the western part of the region. A luxuriant vegetation covers the whole land, making it difficult to obtain a general view, and rendering the work of the explorer very laborious.

There are two seasons in the isthmus. The first, from January to April, is dry and agreeable. The rains begin in May on the coasts, they diminish in quantity from the end of June to August; but the fall is extraordinary from August until the end of November, when the rivers overflow, and the low plains are inundated. Lieut. Wyse considers that the isthmus does not deserve the character of insalubrity, which it has got, and he says that, with the exception of some localities, situated near stagnant marshes, the country is healthy, especially the Pacific slopes. In this opinion his predecessor, Commander Selfridge, concurs.

The aborigines of Darien are of Carib race, and belong to the Indian tribe of Cunas or Irraiques, called *Tule* in their own language. The men occupy themselves in fishing and hunting; while the women do all agricultural and indoor work. A very full account of them at the time of the discovery, in 1513, is given by Pascual de Andagoya, in his narrative published by Navarette,* and we have further particulars from Lionel Wafer, and other sources.†

The Colombian Government granted a concession on the 26th of May 1876 for a ship canal across the Darien Isthmus, which led to the exploring expedition commanded by Lieutenant Wyse. The Committee for exploring the isthmus was formed in October, 1876, in Paris, with General Turr as president. The command of the expedition was entrusted to Lieut. Wyse, who sailed from St. Nazaire on 6th of November with a large staff of assistants. These were Lieut. Reclus; Captain Bixio of the Italian army; M. Celler, an engineer, in charge of the levelling operations; Mr. W. Brooks as engineering geologist; MM. Gerster, Millat, Barbiez, Musso, Baudoin, Lacharme, Sosa, and Archibald Balfour, engineers; Dr. Viguier, naturalist; MM. Genty, Charlot, Merendol, Lenoan and Giocanti, assistants, and M. Pouydesseau, Secretary to the commander of the expedition. Two Colombian interpreters, named Carranza and Recuero, were also attached to the expedition.

Lieut. Wyse determined to commence operations

* See our numbers for February, June, and October, 1877, pages 45, 162, and 276, and for March 1878, p. 75.

* Translated and edited for the Hakluyt Society in 1865.

† *Wafer's Description of the Isthmus* (1704), Cullen (1852, 1857 and 1867), Gisborne (1852), M'Dermot (1857).

on the Pacific side, and the party was conveyed from Panama to the Gulf of San Miguel in a steamer freighted for the purpose, in December 1876. Up to Chepigana, a point to which large ships can be taken, the existing maps are sufficiently correct, especially that executed by the officers of the American corvette 'Resaca' in 1871, and attached to the report of commander Selfridge. The vast estuary formed by the rivers Tuyra, Chucunaque and Sabana is protected at its entrance, by picturesque islets, like baskets of verdure rising from the sea. The harbour thus formed is surrounded by high land, and the magnificence of the scenery is only equalled by that of the harbour of Rio de Janeiro. To Lieutenant Reclus was entrusted the duty of surveying the navigable part of the Tuyra and the harbour. The most important rivers which fall into the harbour are the Sabana, the Chucunaque, the Seteganti, the Marea or Pagre, the Balsas or Tucuti, besides various small torrents. The affluents of the Tuyra between the confluence of the Chucunaque and the sea, are the rivers Pirri and Uruti, and the ravines, Marranganti, Quiperti, Molinera and Estanislao.

On the 14th of December 1876 the expedition arrived at the village of Pinogana, a little above the limit of the tides, where a depôt of provisions and stores was formed, and where carriers and labourers were engaged. This brought the number of men employed in the expedition up to sixty. Lieut. Wyse then proceeded up the course of the Tuyra, fixing the positions of its numerous tributaries; and on the 28th he discovered the pass of Tihule, the lowest in the the whole country. He then returned to Pinogana, and on the 8th of January 1877 the expedition had the misfortune to lose Captain Bixio, one of the most zealous and active of its members.

During January the engineers continued the survey of the Tuyra, while Lieut. Wyse explored the valleys of Capeti, Pucro, and Tapalisa; and on the 15th all the members of the expedition were re-united at Paya. Here Dr. Vignier had good opportunities for studying the manners and customs of the Darien (Cuna) Indians; and he has communicated an interesting paper on their rites and mode of sepulture to the French Anthropological Society. Meanwhile the levellings were continued with a view to determining the lowest point on the water-parting between the two oceans. It was finally established that the least elevated point was the pass between the Tihule and the Nalubquia. The distance between the waters of the two slopes, at this point, is not more than 225 metres, or 246 yards; and the height of the pass above the level of the Pacific at the lowest tide is 466 feet. On the 22nd of January, Lieuts. Wyse and Reclus reached the Atlantic at Pisisi by an Indian road following the Tulegua to its confluence, with the Caquirri which falls into the Atrato. MM. Barbiez, Millat, and Sosa were entrusted with the levelling operations along the course of the Caquirri. On his return to Paya, Lieut. Wyse received the sad news of the death of Mr. Brooks, which took place on the 26th of January owing to a wound from the bite of a vampire, which his great age rendered fatal.

The commander of the expedition then determined to examine the narrow region, which however is wild and unknown, between the Tuyra and Chucunaque and the Atlantic. MM. Reclus and Lacherme were ordered to execute a line of levellings from the confluence of the rivers Aputi and Chuputi with the Tuyra, to the neighbourhood of Port Gandi or Acanti in the Atlantic. The direction, which is N. 36° E. (true), corresponds with that of a very important valley which Lieut. Wyse had obtained a view of by cutting down the trees on the summit of the hill of Tuno, near Pinogana. Meanwhile Lieut. Wyse himself set out for Yavisa, the chief place in the Darien district, situated on a peninsula formed by the Chucunaque and Yavisa rivers. This village has 600 inhabitants, and from it, as a base of operations, the explorer studied the course of the river Chucunaque. He found that this river is deeper than the Tuyra, and that the tide ascends it for a considerable distance. From a hill above the Yavisa, Lieut. Wyse saw a depression in the cordillera, which he determined to reach by following the course of a principal tributary of the Chucunaque called the Tupisa, and thence up the Tiati. The elevation of this part of the ridge admits of a canal being carried over it by an open cutting; but further exploration was impeded by the torrents of rain. On the 19th of May, a third member of the expedition, M. Musso, fell a victim to his scientific zeal.

The conclusion arrived at was that a canal could not be constructed by the route of the Tuyra and Caquirri, without heavy tunnelling and locks, owing to the thickness of the solid rock that must be excavated. But Lieut. Wyse reported that a canal directly up the valleys of the Tupisa and Tiati was feasible, and this is the route which he now recommends. The results of this first expedition are satisfactory, and Lieut. Wyse, after warmly thanking his own colleagues for their zealous co-operation, concludes his paper by paying a just tribute to the value of the work done by the explorers, who immediately preceded him on the isthmus, Commanders Selfridge * and Lull of the American Navy.

As we announced in our last number (p. 74), Lieut. Wyse has proceeded a second time to the isthmus, and we believe that he and his colleagues have been completing their surveys during the season of 1877-78.

ESKIMO REPORTS
RESPECTING
SIR JOHN FRANKLIN'S EXPEDITION.

WE noticed the reported existence of records of Sir John Franklin's Expedition at page 74 of our last number. The matter has since been carefully investigated by Chief Justice Daly, the President of the American Geographical Society, who gave the results in his recent Annual Address.

The ascertained facts are as follows:—In 1872 Captain Potter, in command of an American whaler in Hudson's Bay, met some Eskimos of the Nachili tribe near Whale Point, to the south of Repulse Bay. The Nachilis are the natives of the Boothia Isthmus, often mentioned in the narrative of Sir John Ross.

* Commander Selfridge executed his surveys in 1872 and 1873. (See our numbers for April 1873, p. 32, and July 1873, p. 170.) A Peruvian expedition, under Captain Carrillo, was sent to co-operate with Selfridge. (See our number for October 1873, p. 299, for an account of his proceedings and their results.)

They told him that a party of white men came, a long time before, to a place in the Gulf of Boothia where the Nachili were then wintering, and that they all died there. Captain Potter also obtained some silver and other things belonging to the Franklin Expedition from these people. In 1877 Mr. Thomas F. Barry, in the whaler 'A. Houghton,' belonging to Messrs. Morrison and Brown, of New York, wintered at Marble Island, off the mouth of the Wager river. He was visited by other Eskimo of the Nachili tribe, from whom he obtained a spoon with Sir John Franklin's crest upon it. They told him exactly the same story as had been told to Captain Potter five years before. Two, who were between fifty and sixty years of age, said that they had seen the white men. They added, that the white men had a leader, but that when the spring came they were all dead. After a good many had died, the rest made a cairn, and put under it some things like the book in which Barry was writing, and which the Nachili examined. They offered to go and point out the spot where the cairn still remains, with the books under it; but it involved a journey of several hundred miles, and Barry was unable to undertake it. When asked to point out the position of the island where the white men died on the map, they always put their fingers on a spot in the unexplored part of the Gulf of Boothia N.W. of the entrance to Fury and Hecla Strait, in the direction of Felix Harbour of Ross, on the east coast of Boothia. The wonderful accuracy of these people in delineating coast lines and islands within their actual knowledge is well known from the narratives of Parry and Ross.

Chief Justice Daly has had a long and satisfactory conversation with Mr. Barry, and is thoroughly satisfied of his truthfulness; while Joe (the faithful companion of Captain Hall) bears testimony to Barry's competent knowledge of the Eskimo language. Sir John Ross found that the Nachilis of Boothia were well acquainted with the route to Repulse Bay; and both Ross and Parry ascertained that the Eskimo were acquainted with an extent of country equal to 400 miles of coast, so that the presence of Nachili at Whale Point is quite probable.

We fully concur in the opinion of Chief Justice Daly, that these reports, whether accurate or not, are sufficiently important to call for a searching investigation on the spot. The fact of the same story having been told by separate parties of the Nachili tribe in 1872, and again in 1877, is a proof, at all events of *bona fides*, and of the belief of the tribe in the truth of what they say; while the testimony of two men who were alive and present when the strangers died is presumptive evidence of its accuracy. Moreover, a version of the same story was told to Hall in 1867, when he wintered near Igloolik. He received information that some of Franklin's people had been in Fury and Hecla Strait. He also heard of a cairn built by white men, which he visited in the spring on the west coast of the Gulf of Akkoolee. It proved to be a cairn built by Hudson's Bay explorers in 1847. But this was quite a distinct report from that referring to the white men in Fury and Hecla Strait. The latter is no doubt a version of the same story that was told to Mr. Barry, and, so far as it goes, is a confirmation of it. Hall actually found relics of white men at Gifford river, on the north side of Fury and Hecla Strait, in June 1878.

A comparison of the reports of the Nachili Eskimos with the facts already ascertained respecting the fate of the Franklin Expedition will throw some light upon the question.

On the 22nd of April 1848 the 'Erebus' and 'Terror' were abandoned, and on the 25th the officers and men, consisting of 105 souls, were at Point Victory, on the north-west coast of King William Island. This fact was discovered by Sir Leopold McClintock and Captain Hobson, when they found a record containing the information, and signed by Captains Crozier and Fitzjames. On the 26th the officers and men were to start for Back's Fish river. It is certain that they did start, and that some at least reached Montreal Island, at the mouth of the Back river, a distance of 250 miles by sledge route from the ships. For McClintock found the skeleton of a steward on the beach 135 miles from the position of the ships. Captain Hall found a skeleton on Todd Island, in the strait between King William Island and the coast of America, which has been identified as that of Lieutenant Le Vesconte, of the 'Erebus.' Anderson and McClintock found further traces on Montreal Island. McClintock also obtained several relics from natives on the east coast of King William Island. They told him that the wreck of a ship was stranded in a position now believed, from Hall's report, to be O'Reilly Island, on the western side of Adelaide Peninsula; and they told Hall that one dead body was in it. All this evidence proves, beyond doubt, that the whole of the survivors left the 'Erebus' and 'Terror' with the intention of making for the Fish river, by marching round the west coast of King William Island; that some dropped by the way; but that others actually reached Montreal Island, in the mouth of that river.

But there is evidence that a detachment gave up this plan, and returned to the ships. On the 30th of May, 1859, Sir Leopold McClintock came upon a large boat resting on a sledge, with two skeletons in it, and her head pointing N.E., back to the position of the ships. The conclusion was inevitable that the unfortunate explorers had over estimated their strength, and had found that the provisions they had taken with them could not hold out. Then a detachment must have set out to return to the ships for fresh supplies, with this boat. Their strength failing after a time, they must have abandoned the boat, and left the two men who where unable to proceed. It seems clear that this party did reach the ships, for every soul left them on April 22nd, while the Eskimos found a dead body in the wreck. But they only found one body, consequently the rest of the party must have left the ships again.

The question now arises as to whither this forlorn party would have turned its steps. It is improbable that the men who had returned would have again set out upon a route the difficulties and horrors of which they had already experienced. Obviously they would have made for the nearest known point where there was the faintest hope of succour. At that time the nearest point known to be inhabited was Nachili or the Boothia Isthmus, near Felix Harbour, where Sir John Ross had wintered in 1829—30, and where he was visited by Eskimos. Thence they might have hoped, in another year, to have made their way to Igloolik, where Parry kept up such friendly relations

with the Eskimos in 1823—24, or to Repulse Bay, and finally to a settlement in Hudson's Bay. While the distance from the ships to the mouth of the Fish river, by sledge route, is 250 miles, the distance to Felix Harbour is only a little over 120 miles.

Now it is precisely on the line, from Felix Harbour to Igloolik, that the Nachili Eskimos state that the Island is situated where the white men built their cairn, deposited their books, and died. This portion of the Arctic Regions has never yet been searched, and most of it is unknown. It includes the east coast of Boothia from Stillwell Bay to Lord Mayor Bay, a distance of 118 miles; the opposite coast from Cape Kater to Fury and Hecla Strait, a distance of 170 miles, which is entirely unknown; and any islands that may exist between the two coasts, in the undiscovered southern part of the Gulf of Boothia.

The evidence against the reports of the Nachili is that they had not been heard of before by former able searchers and inquirers in the same direction. But this is negative evidence only, and undoubtedly the island, pointed out by the Nachili Eskimos, ought to be visited and carefully examined. We believe that Messrs. Morrison and Brown, of New York, have it in contemplation to despatch Mr. Barry in a schooner, called the 'Eothen,' this year, to make a journey from Hudson's Bay to the spot, under the guidance of his old Nachili friends.

But the English ought not to be idle, for it is our bounden duty to follow up these traces of our lost countrymen. A steamer should be sent down Prince Regent's Inlet to the Gulf of Boothia, equipped for a winter and provided with the means of sledge travelling; in order to complete the search over the unexplored area. We think that the considerations stated above are of sufficient weight, not only to justify this completion of the Franklin search, but to make it an imperative duty; while such an expedition would, under any circumstances, do much valuable geographical work by exploring the region between Cape Kater and Fury and Hecla Strait.

THE VALLEY OF THE YEN-E-SAY (YENESEI).*

THE Yenesei, pronounced Yen-e-say', is said to be the third largest river in the world, being only exceeded in size by the Amazon and the Mississippi. The principal stream rises in the mountains of Central Mongolia, enters Siberia near the famous town of Kyakh'-ta, on the Chinese frontier, and flowing through Lake By-kal', passes Eer-kutsk' (Irkutsk) the capital of Siberia, under the name of the An'-go-ra or Vairkhuya, Tun-goosk', and enters the smaller stream, whose name it subsequently bears, a few miles to the south of Yen-e-saisk'. Up to this point its length may be roughly estimated at 2000 miles, and judging from the time it takes to sledge across the river at Yen-e-saisk', its width must exceed an English mile. Following the windings of the river from the latter town to the Arctic circle, the road is calculated as a journey of 800 miles, during which the waters are augmented by two important tributaries, the Pod-kah'-min-a Tungoosk' and the Uizh'-ni Tun-goosk', which increase the width of the river to more than three English miles. On the Arctic circle it receives an important tributary, the Koo-ray'-i-ka, about a mile wide, and somewhat more circuitously than appears on our maps, travels to the islands of the delta, a distance possibly slightly over-estimated at 800 miles, during which the average width may be about four miles. The delta and lagoon of the Yen-e-say' are about 400 miles in length, and must average 20 miles in width, making the total length of the river about 4000 miles.

Throughout the whole extent of the river, as far as I travelled upon it from Yan-e-saisk', in lat. 58° to Gol-chee'-ka in lat. 71½°, the banks are generally steep and lofty, from 60 to 100 feet above the water level, and, so far as I could learn, comparatively little land is covered by the summer floods. In this respect it presents a marked contrast to the Obb. The villages on the banks are from 20 to 30 versts (15 to 20 miles) apart, and are of course built upon high ground. In the winter, relays of horses and sledges, and in the summer of rowers and boats, are to be obtained at these villages. As we sledged down the river, we had always a heavy climb up to the post stations; and in descending again into the bed of the river, it sometimes almost made our hearts jump into our mouths to look down the precipice, which our horses took at a gallop, with half a dozen villagers hanging on to the sledge to prevent an upset, a feat which they performed so cleverly, that, although many a peasant got a roll in the snow, we always escaped without any serious accident. We found a good supply of horses as far as Too-ro-kansk'. The second stage from this town we travelled by dogs, and completed the rest of the journey with reindeer. The dogs were fine fellows, black, white, piebald or brown, with long hair, small ears, and bushy tail turned over the back. They never seemed tired, never tried to shirk their work, were good-natured and tractable in the extreme, and are so sagacious that it is a common practice, at the end of a stage, to send the team back to the last station alone with the empty sledge. The harness is of the simplest construction possible, being nothing but a padded belt over the small of the back, passing underneath to the sledge between the hind legs.

Soon after leaving Yen-e-saisk' agriculture practically ceases. A few cows graze on the meadows near the villages, and hay is cut for their use during winter, but the villagers are too busy fishing during the short summer to till the land. At Sit-o-vah'-noff, however, not far from Too-ro-kansk', the unfortunate Scop'-si cultivate potatoes successfully.

The banks of the Yen-e-say' are clothed with magnificent forests up to the Arctic circle, but northwards the trees rapidly diminish in size, and disappear altogether soon after leaving Doo-din'-ka, in lat. 69½°. These forests are principally pine of various species. The larch extends further north than any of the other pines, and is abundant, though small, at Doo-din'-ka. Further south it attains large dimensions. At Yen-e-saisk' a larch pole suitable for the mast of a ship, 36 inches diameter at the base, 18 inches diameter at the apex, and 60 feet long, may be bought

* The Russian names in this paper are all spelt phonetically. The only explanation required is that *kh* represents the German gutteral *ch*. I have accented the syllable upon which the *emphasis* must be laid, a very important point in the pronunciation of Russian.

for a sovereign. This hard, dark wood looks very well for the walls and ceilings of the peasants' rooms. The spruce fir, perhaps the most elegant tree in the Yen-e-say' forests, with branches almost down to the root, and trailing on the ground, is still more abundant, and extends nearly as far north, say to lat. 69°. The Siberiaks look upon this tree as one of the most important for commercial purposes. The wood is white, of very small specific gravity, and very elastic, and is said not to lose its elasticity by age. It is the favourite tree for ships' masts, and is considered the best substitute for ash for oars. Snow-shoes are also generally made of this wood. The quality is good down into the roots, and it makes the best knees for shipbuilding, not requiring to be cut out of the solid or artificially bent. It is, however, subject to very hard knots, which are said to blunt the edge of any axe not made out of Siberian steel. The Siberian spruce is less abundant, and does not extend so far north. I did not observe it north of lat. 63°. It differs from the common spruce in having a smooth bark of an ash-grey colour. The leaves are also of a much darker, bluer green. It has little commercial value on the Yen-e-say', the wood being soft, and liable to crack and decay. Being easy to split, it is largely used for firewood and for roofing. The Scotch fir, with the upper trunk and branches almost of a cinnamon yellow, is in many places the most abundant forest tree, but does not extend further north than lat. 62½°. The Siberiak is, however, proudest of his cedar, a tree very similar in appearance to the Scotch fir, but more regular in its growth, clothed with branches to nearer the ground, and with an almost uniform grey trunk. The wood is dark, but not so dark as larch, and there is very little of the white inferior wood next the bark. If stacked too long in the forest, it is liable to be attacked by the worm, but for furniture and indoor work it is considered to be the best timber in Siberia. It is said never to rot, or shrink, or warp, or crack. It is soft and easy to work, but has nevertheless a fine grain, and is almost free from knots. The Ost'-yaks use it for building their ships. They take a trunk 2 or 3 feet in diameter, split it, and of each half make a wide, thin board. The rest is wasted. Such an extravagant tool is the axe! The Russian peasant is still more prodigal with his timber. It is by no means an uncommon thing to see magnificent cedars cut down, merely to be stripped of their cones, to provide the peasant with a sackful of his favourite cedar-nuts. I noticed this tree up to lat. 67½°. The birch is common up to lat. 69½°, and in various places I noticed that, where a pine forest had been burnt or cut down, it appeared to be immediately replaced by a luxuriant growth of birch. The creeping birch and two or three sorts of willow are common in suitable localities on the tundra as far north as we went, *i.e.* lat. 71½°. The alder was abundant at 69½°, and the juniper at 69°. I did not observe the poplar further north than lat. 66°. The Ost'-yaks hollow their canoes from the trunks of this tree.

We came into contact with several of the native races. The Russians call them all Asiatics. The name in general use among the Polish exiles, with whom I was able to converse in German, was "die Wilden."

The most northerly race is that of the Sam'-o-yades. They extend from the Kah'-nin peninsular in Europe to the North East Cape in Asia, occupying the land to about 300 miles from the coast, exceeding that distance at the Gulfs of the Obb and the Taz, the whole of the shores of which they are said to frequent.

The Yu-raks' are not a numerous race, and occupy the district between the east shore of the Gulf of the Taz and the Yen-e-say', from the Arctic circle to about 70° N. lat. They seem to me to be very nearly allied to the Sam'-o-yades, especially to the Sam'-o-yades of the Pet-chor'-a.

The Ost'-yaks are distributed immediately south of the Yu-raks', from the Arctic circle to the Pod-kah-min-a Tun-goosk'. They seem also to be nearly allied to the two preceding races, and to speak a dialect of Sam'-o-yade, and must not be confounded with the Ost'-yaks of the Obb, who are said to be a Finnish race.

The Dol-gahn' territory is bounded on the north by the Sam'-o-yade land about 70° N. lat., on the south by the Arctic circle, and on the west by the Yen-e-say', from which river it extends eastward 300 or 400 miles. These people are of quite a distinct race. Instead of being sallow complexioned like the races previously mentioned, they are more copper coloured, and if we may judge by the taste they display in ornamenting their dresses with beads, more civilized. From their language, and especially their numerals, we may infer their close relationship to the Tatars of Western Siberia and Eastern Russia, and also to the Turks. They must, however, have separated from these nations before the latter became Muhammadan. They are said to possess calendars, made of wood or mammoth ivory, hexagonal and tapering slightly from the centre to each end. On these the days and months are marked, with signs for the Russian holydays. There are other signs upon them, said not to be Russian, but to resemble Runic characters. Their nearest relations are said to be the Yah-kuts', a race which we did not meet with, but who, we were told, occupy the district watered by the Kat-an-gar' river from 70° to 73° N. lat. Whether these Yah-kuts' are of the same race as those inhabiting the valley of the Lay'-na (Lena) I am unable to say.

The Tun-goosks' occupy the districts on the east bank of the Yen-e-say', drained by the Uizh'-ni Tun-goosk' and the Pod-kah-min-a Tun-goosk'. They are also a copper-coloured race, but of a very low type of feature. I was told that their language is also nearly allied to that of the Dol-gahn. If this information is correct, they are probably a different race to the Tun-goosks' of the the Lay'-na

Part of these tribes have been nominally converted to Christianity, but by far the greater portions prefer the purer faith of their ancestors to the fetishism of the illiterate Russian peasant. Like the North American Indians, they believe in a great spirit, and have vague notions of happy hunting grounds beyond the grave. They do not bury the dead, but lay them out on the tundra or in the forest, in their best fur, with their bows and arrows and a supply of food. Their favourite reindeer is also slaughtered and placed by their side, so that they may not arrive in the next world altogether unprovided for. They have a semi-fetishism of their own. Each family has a collection of household gods, but these are used for divination and not for worship. These images are carried on a

sledge, set apart for their use alone, drawn by reindeer reserved for this purpose only, and they are covered by a clean reindeer skin, *i.e.* one upon which man has never slept. The diviner is called a Sham'-man, and answers to the medicine man of the North American Indians. His dress is hung round with scores of pieces of iron, sometimes rudely fashioned into the shapes of animals or fishes. The Sham'-man arranges the household gods on the sledge, whilst the people stand in a circle around him. Then they begin to dance round, until they and the Sham'-man become excited, the latter getting into a state bordering upon frenzy, and sometimes foaming at the mouth. In this state he is supposed to exercise supernatural influence upon the sick, or upon the weather, or to give supernatural information respecting lost reindeer, or productive hunting or fishing grounds.

The great event of the year in the valley of the Yen-e-say' is the annual battle between the sun and the winter forces, ending in the breaking up of the ice on the great river—a stupendous performance, the magnificence of which can scarcely be imagined by those who have not been eye-witnesses of the scene.

Last year, when Captain Wiggins and I were on the Yen-e-say', the ice broke up in Yen-e-saisk' on the 1st of May. On the 21st it was broken up at a village 200 miles north of Too-ro-kansk'. Two days later 100 miles more were broken up. On the 1st of June the first movement of the ice at the Arctic circle took place. On the 12th the revolution took place at Vare'-shin-sky, in lat. 69°, and on the 18th at the island of Mah'-la Brek'-off-sky, in lat. 70½°, and two days later at Gol-cheek'-a, in lat. 71¼°.

On the Arctic circle, the first real indication of summer was the appearance of a swan on the 5th of May. On the 9th we had the first rain, and saw the first goose. On the 24th the water under the ice had risen so much that the ship, which had been frozen in on the 17th of the previous October, floated. On the morning of the 1st of June, a slight revolution in the ice, at the juncture of the Koo-ray'-i-ka and the Yen-e-say', took place, and early the following night the Yen-e-say' rose so rapidly that it began to flow up the Koo-ray'-i-ka. By midnight the ice on the Yen-e-say' south of the Koo-ray'-i-ka was broken up, and thousands of acres of pack ice were marched up the smaller river, at speeds varying from 4 to 6 knots an hour. The snow, which up to this date had covered the ground to the depth of 6 feet, began to melt rapidly, and migratory birds began to arrive in countless thousands.

About midnight, between the 2nd and 3rd of June, an enormous pressure from above came on somewhat suddenly. The great field of ice to the north of the Koo-ray'-i-ka was broken up. Many more thousands of acres of pack ice were marched up the Koo-ray'-i-ka, and we frequently saw huge icebergs driven down the Yen-e-say' at a speed not less than twenty miles an hour. All this took place to the accompaniment of a perfect babel of birds. The cries of thousands of ducks and geese, the demoniac laughter of gulls, and the screams of the red-throated and black-throated divers, like the cries of children in pain, filled the air. This lasted for fourteen days, the river alternately rising and falling, the ice being alternately marched up the Koo-ray'-i-ka, and then marched down again, the total rise in the rivers during this period being upwards of 70 feet. At last the sun, having made an alliance with the south wind, came off victorious, and the last march past of the defeated forces of winter was over, and for seven days more the tagrag and bobtail of the great Arctic army came straggling down, worn and weather-beaten little icebergs, dirty floes that looked like mud banks floating along, and straggling pack-ice perishing on its march.

The snow had no sooner melted from the ground than vegetation seemed to spring up as if by magic. Three days after the grass was bare, the wood anemones and the March marigolds were in flower, and many of the birds made preparations for breeding.

A very large number of the species of birds had however merely crossed the Arctic circle on their way to the tundra beyond the limit of forest growth. The Siberian tundra is something like the fjelds of Lapland—something like a Scotch moor, or an Irish bog. It is a wild undulating extent of country, full of rivers, lakes, and swamps, stony but not rocky, gay with brilliant wild flowers, and abounding with ground fruits, such as crowberry, cranberry, cloudberry, and Arctic strawberry. The hill-tops are barren and stony, but the valleys shelter dwarf willows and stunted birch. Insect-eating birds are amply provided for by myriads of musquitoes. These tundras are evidently rising gradually. Ancient drift wood rotted into tinder is often found above the present limit of the highest floods, and at Gol-cheek'-a I found large heaps of recent sea-shells, at least four miles from the river bank, and 500 feet above the level of the sea. At Doo-din'-ka I saw excellent coal, and copper ore, said to analyse from 5 to 10 per cent. of copper, which had been brought down in considerable quantity from the tundra. The river abounds in fish, sturgeon, sterlet, nyelma or white salmon, and other excellent kinds, and at Gol-cheek'-a we saw hundreds of beluga, or white whale. The principal trade which will no doubt some day be carried on between this country and Siberia, *viâ* the Kara Sea, will not be in Arctic products, but in the unlimited produce of South Siberia, which can so easily be floated down the Yen-e-say' and the Obb to some port which may be selected near the mouths of those rivers. To attempt to take a steamer to these rivers on speculation, with the chance of picking up a cargo, is simply throwing away money. The duration of open way in the Kara Sea is too short to admit of the ascent of either river to any town where a cargo can be obtained. The appearance of any vessel at such town would raise the value of produce to famine prices; and the navigation of the rivers is too dangerous for ships drawing depth of water sufficient to be seaworthy.

A responsible agent must reside in the country; for the Yen-e-say' at Yen-e-saisk', the emporium of the gold-mining district; and for the Obb at Tyumain', within easy reach of the great fair at Eer-beet' (Irbyt); and he must himself accompany the cargo down to the port, where storehouses must be built for the safe wintering of any cargo that the steamers are unable to take. Cargoes may be towed down in lighters by the Russian steamers on the river, but eventually it will no doubt be found most profitable to have tug steamers for the purpose, which ought not to draw more than thirty inches of water. Some difficulty may be found in selecting suitable ports.

The present port of Gol-cheek'-a on the Yen-e-say' is entirely unsuitable. The sand banks at the mouth of the little river of Gol-cheek'-a increase every year, and this harbour will probably soon have to be deserted. No ship drawing more than 5 feet of water ought to venture there, and then only with great care, for the channel is a very tortuous one, and continually becoming shallower. A colossal fortune awaits the adventurer, who is backed by sufficient capital, and a properly-organized staff, to carry on a trade between this country and Siberia, *viâ* the Kara Sea, provided always that he combines British pluck with German "Grundlichkeit."

H. Seebohm.

MEMOIRS OF HANS HENDRIK

(The Arctic Traveller).

IV.

My Fourth Voyage to the North, when I was Engaged by the Tuluks.

[*The English Expedition under Nares.*]

Once I set out in a boat to fetch blubber from Southern Upernivik [an outpost about 40 miles south of Upernivik]. When we had departed we soon fell in with southerly wind, and therefore made for a harbour called Inginelertok. Ascending a small hill and looking seawards, I sighted two ships off the place where we were, and made out that they were Arctic explorers. I went down and set off again for our destined place. The wind was not very strong, but the current took us to the north. The breeze abating, we took down the sails and rowed back to the harbour. I again went up the hill with the Kavdlunak cooper. He questioned me about the road to Southern Upernivik. I pointed out to him where one had to go either by crossing the hills or by coasting. I thought he had asked me the question without any particular purpose. When we came down to the boat he asked me for a walking-stick. I gave him the longest tiller, thinking he intended to walk to Southern Upernivik, though he did not mention it. However, we waited for him till towards evening, when I went up the hill, and spied him with the glass. In the evening a southern gale sprang up, with heavy rain and a foaming sea. I feared we should have been driven ashore, as, for want of a spot to fasten a rope, we only rode at anchor. I did not sleep the whole night. My men tried to sleep, but could not, on account of the rain. In the morning, when the wind abated, I said to my crew: "I will turn back now. If we remain here, we shall have nothing to eat. However, I know that the assistant will reprove me, thinking I have done so for the sake of the Tuluks." We reefed sails, took up the anchor, and started. We made a good headway, with a favourable wind. On approaching our settlement [the outpost *Pröven*, belonging to Upernivik], we put out the reefs, as the wind lessened.

On entering the harbour we found that the Tuluk vessels had arrived. When we were going to anchor, the assistant [outpost-trader] came down, I feared to scold me; but on the contrary, he accosted me very friendly: "I am glad thou hast returned, otherwise the Tuluks would have gone to fetch thee. Thou art to follow the northern explorers, taking Matak along with thee." When I heard this I reluctantly agreed. I went up to my house to take my best clothes. before I was ready they shouted outside: "The assistant wants thee." When I came out to him, I found there the Tuluk officers who had come to ask me whether I was willing to go with them or not. At the same time the assistant gave me a letter, by which I understood that I was to go with them. Consequently when they asked me whether I was willing, I complied. They also talked about a companion for me. I said I should like, as I went along, to pick up my wife's brother who lived near Kip John [Cape York?]. I believed him to be a good hand at building snow huts. But as I was now going to depart, I pitied my wife and my little children who were so attached to me, especially my only son who would not cease crying, as he preferred me to his mother. I said to the master of the ship, that I should like to take my little son and my daughter Augustina along with me to Upernivik, where they were to remain. Thereupon I left Kangersuatsiak, making my fourth visit to the north, with the Tuluks.* When we put to sea and I looked at the people on shore, through the spy glass, I discovered my little daughter, Sophia Elizabeth, lying prostrate on the top of a big stone and staring at us. It was a sad sight which made me shed tears from pity. But I felt consoled by thinking that if no mischief should happen me or her, we should meet again. I also got sight of my wife standing amongst the crowd and looking after us. I said to myself with a sigh: "May I return to them in good health."

We arrived at Upernivik in the morning and again left in the afternoon; my two little children followed me to the beach. We made our way behind the islands. East of Kingitok we stopped for a little while, as the other ship had run on a reef, but soon got off again. North of Kingitok two kayakers left us, who had followed us as pilots from Upernivik. We continued to proceed towards the north, until the country where people live came to sight, called Kip John by the Tuluks and Ivnanganek by the natives. When we were off this coast, we parted company with the other ship, to visit the native settlements, and try to find the man I wished to take along with me.

When we landed I observed footprints of men in the snow, and supposed they were those of people living in the eastern settlement. When they had made fast the boat to the ice, I went over land with an officer and a Kavdlunak cooper, whom the Tuluks had engaged. While we walked over the hills, I observed a sledge standing on the ice near the waters' edge. We made for the eastern hamlet, but when we arrived we found the houses empty, and only some sealskins spread to dry. The sledge which we saw had first been driving in an easterly direction, but when they discovered the vessel they turned towards her. When they came close to the ship, I asked them: "Do ye know me?" They answered: "Yes, dost thou recognise us?" I rejoined: "I only recognise that old man amongst you." Who the others were I could first make out when they had stated their names, as I knew them well when they were children. I questioned them: "Is Augina well?" They

* Hans was on board the 'Discovery,' Captain Stephenson.

answered: "Yes, pretty well." "Where is he?" "On that island yonder." When I heard this I said to the Tuluks: "They say that he stays yonder on the island." The commander then wanted the natives to go and fetch him by sledge, but they said they did not like on account of the great distance. Just when we arrived here, the Tuluks had caught a narwhal: they gave the natives some of its skin to eat, and some biscuits. They did not care very much for the bread, but greatly preferred the *Matak* (whale-skin).

We started and proceeded along the edge of the ice towards the island, but stopped before we came close to it. I then went quick by sledge with two companions, an officer and the Kavdlunak cooper. By the way we discovered two sledges driving north of us. I instantly directed our course towards them, and coming up asked: "Where is Augina?" They answered: "Yonder on the island, we come thence making a long circuit on account of a crack." I repeated this to my companions, who replied that I might go thither: they intended to return to the ship. I answered: "If I go, I shall not be back before to-morrow, the captain has ordered us to make haste." When I made this objection, they agreed that we should only return to the ship. These people also soon recognized me, though I did not them, before they told me their names, as I had only seen them in their childhood. The old ones I knew quite well. We repaired to the vessel followed by the natives; after having searched in vain for him whom I wished to engage.

Starting from this place we continued our course northwards, and touched at Eta. Here we went up the firth to hunt reindeer, and came to the head of it. We had the Captain with us. His steward asked me to wait a little as he wanted to go with me. When I went off with the master I fell ill from stitch. I got sight of a hare, and when we drew nearer there were two, of which the master shot one, and I the other. When we had ascended the top of the hills and proceeded towards the glacier, my illness increased, and I said to the Captain that I should like to turn back, to which he agreed. In returning by the way, I picked up the hares. My stitch grew worse; when I came to our camping place they were going to cook. I had a severe cough, shivered from cold, and felt very ill. Our companions came back with one reindeer. When we had finished cooking and eating we returned on board. The following day we left. I now grew very ill, and thought my life was near its end, although we were unable to know the number of our days. The doctor, however, gave me medicine, but it was of no avail, and I could eat nothing. At length he cupped me on my back, and this took effect, I began to improve.

We now went north, coasting the Westland, while our ships sometimes were stopped by ice. Whenever it retired from the shore we went on, and when it grew very bad we made fast to an iceberg. In this way we reached the narrowest part of the sound between our country and the Westland.

On the 18th of August I caught my first seal, a Natsek (firth seal). On the 22nd, in the night, we arrived at our wintering station. When in the morning I came on deck, they told me that on board the other vessel they had got a musk-ox, and I believe three walruses, and that they had seen seals. It was a great joy to know that here, there was something to hunt. I was also informed that the other steamer was to proceed farther, while we had to winter in this place. When the others were going to start, I went ashore to accompany them in my kayak some distance and bid farewell to my comrade, the other native. I stopped at the side of the ship and talked with him, whereupon I went ashore in search of musk-oxen. I ascended a hill and got sight of a large one. I approached, taking care he should not see me. While he went up another hill, I came close above him. Just as he saw me he took to running, but stopped to stare at me, whereupon I fired, but at the same moment he rushed on me as if unhurt. I retired, loaded again and fired a second time, still he moved towards me. But when I fired the third time he turned back, and at the fourth shot he fell. This, my first success in ox-hunting, happened on the 23rd of August. While cutting it up, two officers caught sight of me and I heard one of them cheerfully exclaim: "Look there, Hans has got an ox!" After having stayed a while with me they said: "Better remain here, we are going on board to give information, and then the sailors will come to fetch it." When they had gone it grew evening, I spied with my glass, but nobody appeared. At last I repaired to the ship. I was asked: "Where are the men who went to fetch it, ?" I replied: "I did not see anybody, I was tired of waiting for them and went off." I was informed that they were gone to bring me food. Not before I had been down to take my meal and came on deck again they returned.

The next five days I continued hunting, but in vain. On Sunday we attended divine service. The following day, August 30th, I travelled six English miles into the firth, crossed a hill, and, spying with the glass, discovered one ox. I descended towards the head of the firth and saw a herd of the same kind. Unfortunately my ammunition was insufficient, I had only nine charges left. However, I came up to them, shot six, and as then my ammunition was used up, I pelted one more [which was wounded?] with stones, but without killing it. I then returned. The day after I did not go out, but the next we set out to skin the oxen. We were accompanied by two officers who intended to go a-hunting in another direction. When I had climbed the hill I waited for my companions, and on their coming up we found the one I had pelted now dead. Its flesh began to turn on account of the entrails not having been taken out. Towards evening when they were going back, I said: "I will remain here until I have skinned them all." "But how wilt thou sleep?" "The ox-hides will afford me sufficient covering." When we had cooked and eaten they left me. In the evening when I had finished, I went to sleep. On awaking I saw three hares, I seized my gun and fired, but without hitting, whereupon I lay down again. After a while I rose, breakfasted and joined the ship.

On the 7th of September I got one ox, and only two hares on the 25th, and five in the beginning of October. When ice had formed, our Captain wanted to travel by sledge. We also went in search of the other ship in three sledges, one of which was drawn by dogs, and went back. On the third day we tried by land, but were obliged to give up on account of the deep snow. Some of our party also made a trip

in another direction, but soon returned without having seen a live thing. I have noted my game during this season as follows:—October 12th, one hare; 13th, one; 17th, one; on the 16th, the sun was just to be seen [the last time]—18th, two hares; 19th, two; 22nd, one; 23rd, one; 26th, one; 27th, one.

In the month of November, moving about became difficult from the darkness. About this time I ceased to keep a record of the days. As I could not go out hunting more, I lent a hand at work. We built up walls of snow, making a large house for amusements [performances], and another large building we formed out of ice, intended for a smithy. The iceberg from which we fetched ice for drinking water was half an English mile off. I sometimes joined the men who had the charge of this, as I could not stand having nothing to do. I was not engaged for sailor's work, but only as hunter, sledge-driver and dog feeder. This is what I had promised on leaving my home.

For three months I had no work at all. When daylight appeared and one could look for some game, I again tried for hares: the first time I got three, then sometimes two, and sometimes one. Already before the sun began rising again I was on my legs. I also did duty as the Captain's sledge-driver in surveying the country and climbing the hills, but when he remained at home, I went alone.

While the dark season still lasted I began to perceive that some of the crew were talking about me, and had wicked designs towards me. We also used to collect at nine o'clock in the morning, and stand upright in a row near the ship in military fashion. But I being a native was not accustomed to this. Two officers then proceeded to examine our faces, arms and feet [?] A little after nine o'clock the clergyman appeared to read prayers. This was repeated every day. Also in the evening they assembled to be inspected, but then without divine service. One evening I heard them talking thus: "When Hans is to be punished, who shall flog him?" The boatswain answered: "I." To be sure, as I am not very clever in English, and do not know whether I have thoroughly understood their meaning, I only have written this without any particular purpose

I also remember that in the beginning, when we took our meals, I was placed at the table of the first-class sailors [petty officers?], but afterwards I abstained [?] from their table. In this way I grew dejected, and the sadness of my mind was increased by my having no business on account of the terrible darkness. So when I took a walk near the ship I used to fall a-weeping, remembering my wife and little children, especially that little son of mine who was so tenderly attached to me, that I could not be without him even when I was travelling with the transport boat. However, I had one friend, a young man named Tage;* he sometimes took a walk with me, and when I made him know my sorrow, he consoled me. But at length my thoughts grew on me, and I took it into my head to go away to the wilds. If I should freeze to death it would be preferable to hearing this vile talk about me.

Once when heavy with grief I thus walked alone, I again heard them gossiping in their wicked manner. I then said to myself: "These people are all united as countrymen. I am the only one without any comrade of my nation, the only abandoned one"—and I ran away in the black night a distance of about 5 miles, when I stopped and meditated: "Our Captain likes me; perhaps he will send people in search of me. I will return, and if I am to be treated ill, the All-Merciful will pity my soul." I turned back but resolved to stop in the neighbourhood of the ship, as I knew our Captain who was my friend would search for me. I went ashore, dug a hole in the snow and lay down. I had just fallen asleep when I heard footsteps, and as they approached I went out. They asked me: "Hast thou slept?"—"Yes, I have slept." "Dost thou feel cold?"—"Only a little." The two officers said to me: "Our Captain was afraid thou wert lost, we have followed thy footprints, go home now." We went down upon the ice and met several men carrying torches. On coming on board the boatswain accosted me: "To-morrow morning sleep sufficiently; when we rouse thou needst not rise, only sleep in peace," The next morning I did not rise before I had slept well. At noon I got something to eat, and towards two o'clock I was summoned by the Master, who questioned me: "Why didst thou run away last night?" I made answer: "I heard them talk badly about me, and thought they reviled me." He rejoined: "Whenever thou hearst them speaking thus, tell me directly." I afterwards heard them speaking several times in the same way, but, nevertheless, did not mention it, because I supposed that, if I reported it, none of them would like me more.

When bright daylight had set in, the Captain and I used to travel about by sledge, to measure the height of the mountains. Once, on our way homeward, we saw a Tuluk coming. On drawing nearer, he shouted to us that a sledge had arrived from the other ship. When we returned, the officer next the Captain, Mister Bluman,* reported that Petersen had been frost-bitten, and that both his feet had been cut off. First they had departed, but turned back again on account of his being frost-bitten. All the others were well, they said. Coming on board, we met the four Tuluks. I made inquiry about my dear countryman on board their ship, and it gave me pleasure to hear that he was well. A few days later we set off for the south with three sledges, two of them drawn by men, while I, with the Commander, drove in a dog-sledge. We were five persons in one sledge. The two hand-drawn sledges were intended for carrying provisions, to make deposits in the uninhabited tracts. The Captain and I returned, I have forgotten how many days after, leaving the others, who proceeded still further south. Having spent three days on board, we started to visit the other craft. We were five now also, and it took us several days to go thither. When I got to the ship, and saw my countryman, he appeared to me like a brother. He went off the next morning, and was absent sledging, I believe, for three days, and we then set off on our return journey. We fell in with a tent, a party with the boatswain as their leader, who had crossed to a part of our country [Greenland]. The other party, in charge of the officers, had continued their trip. We stayed for awhile with them, and then went on. When we came to the rough ice we stopped, the Captain saying to me:

* Page, Captain Stephenson's steward.

* Lieut Beaumont, R.N.

"Look well after the road we have to go; if thou thinkest it is possible, we will proceed to-morrow." When we had eaten we went to sleep here. Early the next morning, while the Captain slept, I rose and went up the hills to con the ice. From the top I discovered that farther off the shore it was quite smooth. When I came down to the tent I found our cook at his work. The Master asked me: "How is our road?" I answered: "Farther outside it is excellent." After breakfast we started. When we had passed the hillocks we came to level ice, advanced quickly the whole day and went ashore in the evening, reaching our ship the following day.

Some time later we set out for the harbour where we wintered [Polaris Bay] when I was engaged with the Americans, on the coast of our country [Greenland], whereas now I was wintering on the west coast. We crossed the sound and arrived in three days. We found the house and put up our tent at its side. We took out the provisions [?] and examined them, the bread, the casks with smoked beef, one with molasses, also onions and several other kinds of eatables, whereupon we returned.

Afterwards we went off in three sledges. First, two drawn by men and carrying a boat; then we others followed three days after in a dog-sledge. At this time the sun began to give warmth, for which reason we slept by day and travelled in the night. We left in the evening, slept once and then reached the others who moved on foot drawing their sledges. We joined them and went in company to the opposite coast [Greenland] where we put up three tents on a cape, it was very pleasant indeed. Here we spent many days waiting for the party from the other ship. I had to drive with two officers, the second boatswain Fransmand Telle* and Mister Fulfut† and Kapine,‡ a young surgeon [?]. When at length they arrived, four sledges started on their return [?], whereas I with the two officers and the second boatswain set out for the south, to explore the interior of the firth.

At first we got along quickly and slept on the smooth ice. The next day we reached the glacier at the head of the firth. On the following we went out on foot, the two officers and I, along a steep cliff. In returning, the officers said to me: "Go to the tent and say: the officers want thee as cook: they are coming and will soon be here." I did as ordered, and when they came in, we ate and rested, smoking, whereupon off again to the glacier. During the night we walked over it [?]. In the morning when the sun gave warmth, we rested on the glacier. While the officers took a walk, I went off shooting, as I expected there might be a bear. I left my own gun and took along with me a breech-loader belonging to the ship. I went down upon the ice and came to a fissure. Here I shot at a big seal but missed it, when it emerged I missed it again. Next day I went off with my own gun and met with a large seal lying upon the ice. I crept towards it hiding myself behind my shooting curtain, and shot it, whereupon I went to fetch the sledge and dogs. The man who had remained came to assist me; we boiled some seal flesh, and had an excellent meal.

* Frank Chatel, Captain of the Forecastle, H.M.S. 'Discovery.'
† Lieut. Fulford, R.N.
‡ Dr. Coppinger.

Our two officers had tried to walk over the glacier but found it very difficult, its surface being both slippery and terribly traversed by fissures. Before we started I went to fetch some of my seal flesh, whereupon we repaired to the edge of the glacier and rested there. The next day I brought the rest of the seal to the shore, and we crossed to the opposite side of the bay over an even ice field. Also from this side we found the glacier difficult of access, on account of its ruggedness. From hence I went with only one companion, Mister Fulfut, to look for the provisions we had deposited last year in a place thereabout. We found one bag with bread removed from the others; I think a bear must have tried to bite it. We returned to the rest and soon proceeded to an island in the mouth of the firth. I went hence with one man to fetch my seal flesh. On returning I got sight of an Utok [seal upon the ice]. I passed our tent, made for the seal and succeeded in shooting it, but left it to be taken away afterwards. The next day we examined the island.

From this spot we travelled to where I had wintered some years before, and where our house still stood [Polaris Bay]. We camped on the ice. On our arrival we found a sledging party without dogs, headed by an officer who last year had been with our other ship. They were in a pitiful state, suffering from scurvy, one of them having died, and only the officer and one man being able to walk properly. We made this place our temporary settlement, while I undertook to catch seals for them. The doctor ordered them to eat seal flesh to recover strength. At the same time we expected another party under the first lieutenant. After several weeks, as we began to grow anxious, I set off to look for them, accompanied by an officer, named Mister Rulsen,* and the doctor. We travelled all night, and when we approached our resting place, I left my companions, to look for the provisions placed there by me the other day. On my way back I fell in with a hatching ptarmigan. I seized it and likewise took the eggs, I believe there were six, and they were without young.

Next day we continued our searching for the missing party. I told my fellows I preferred driving overland, as there was too much snow on the ice. We took the strand and followed the shore-ice, but found it frequently inundated and almost impassable on account of the streams from the hills. My companions therefore walked over the land, while I continued along the shore-ice. They soon shouted to me to stop, as it was time to dine. Consequently we halted and took to cooking. When they came down to me, I said; "Look at that black point yonder, it appears to be a tent, and close by it I see something like a sledge." I grasped my spy glass and to our great joy made out the tent, the sledge and the two men.

When we had finished our meal, we left our tent and hastened to them. On drawing nearer, they came towards us, three men pulling a sledge. They stopped, and one of them advanced. We soon recognised him, Mister Bluman,† the officer next the Captain. He reported that they had four men sick, two of them on the sledge, two in the tent. Moreover, of the remaining three, one could scarcely walk, so

* Lieut. Wyatt Ranson, R.N.
† Lieut. Beaumont, R.N.

there were hardly more than two to pull the sledge, and the leader looked very emaciated. We came up to them, and found their condition appalling. After having taken two on my sledge, I brought them to our tent, whereupon we fetched the others, with the tent and some provisions, my companions assisting by dragging. When we had rested, we removed to the place where we had our provisions [?]. I first had two [sick men?], and then returned to take the other two, just as the day before. Here we stayed awhile. I went out to shoot seals on the ice, but got none, on account of the deep snow mixed with water.

We started, I carrying the luggage on my sledge. I was obliged to stop at times, to enable them to come up. I therefore proposed to fasten the other sledge to mine. When we had done so, we moved on quickly, both sledges being dragged by the dogs, and the hindmost, moreover, pushed forward by men. We travelled the whole night; when the sun began to grow hot, we rested. Next morning I started, with the doctor and two sick men, to reach our friends, whom we had left at the late wintering station of the Americans. We travelled the whole night under great difficulties, on account of the streams running down from the land and the inundated valleys. Having arrived, and given rest to the dogs, I went back again with two men; but before we started, one of the ailing men whom I had brought died. First we travelled over the ice, but as we were unable to proceed for water, we went ashore. I drove as much as possible over snow, although it was very soft and filled with water from below, whereas my companions preferred a snow-bare road.

When we reached the tent, the two officers came out to us, and when they were informed about the one who had died, they asked us not to mention this to their patients. When we had eaten we lay down in the resting-place of the officers. One of them wanted to use my dogs to fetch what they had deposited. When we awoke he had already returned, and was sleeping upon the sledge. We placed the two sick men and the tent on the sledge, and started with two sledges, both of them loaded [?]. When we were to go down upon the ice we left the other sledge and reached the house.

We now had three tents here a great part of the summer. I caught seven Natsek and three Ugsuk seals. Their flesh was a sort of medicine to the invalids. In June, hunting on the ice was hindered by its being covered with water. As soon as this began clearing off, I said to our officers that it would be better to cross the sound with the dogs before the ice broke up, as there was not sufficient room in the boat. They consented, and I believe two days after they went off [?]. I followed to assist them, but returned to hunt for those who remained. Four days after their departure the ice broke up; I believe it was the day after they had reached the opposite shore.

Thereafter we waited many days for those who should come to fetch us. At length we sighted people dragging a sledge and a boat. It was our Captain, who arrived with a number of sailors. After having stayed some days, he said to me: "To-morrow we will repair to the ship; go with us as our guide." Next morning we went off, leaving the sick, who had begun to walk about. When we were going, our Captain said: "Now, show us the road; go ahead of us, and we will follow." Thereupon we started, and crossed the open water in a boat. When we came to the heavy ice, I searched for the best road, accompanied by the Captain. He used to question me: "Which way are we to go?" I answered: "Look here; this will be better." It was lucky the Commander treated me as a comrade; I did not feel shy in speaking with him, as with other gentlemen. So we travelled partly over ice, partly by sea; I don't know how many days it took us to cross the sound. When we had reached the Westland, we proceeded by land to the ship. On approaching it we met with two men who were sent out to bring us something to eat—one of them the shoemaker, the other an engineman. We rested and cooked, glad to see each other again, both of them belonging to my particular friends. After having finished our meal, we proceeded on board.

After reposing for two days, I went out to look for hares and wild geese. There were also many owls in this place, young as well as old. Of hares and geese I sometimes got as many as I could carry on my back [?]. But pretty far off the Tuluks had a tent on the top of a hill, to watch the approach of the other ship, which was now expected, and at the same time look for the men we had left on the opposite coast. Once it was said our other vessel was close by, only stopped by ice. This gave us much pleasure, the boat which was expected from beyond the sound now being our only care. Again they reported that our other ship had run ashore, but would be able to get off at high tide. Others believed it could not get off. To our great joy, it arrived. Now people were sent to fetch those on the opposite coast. They were turned back by ice, but then the others arrived of their own accord, and now at length we were ready to start on our return voyage, though the ice was still very bad.

The Captain of the other vessel kept a good look-out for the road; he went up the hills incessantly without being tired. At length we started, although it appeared as if there was no thoroughfare in the direction we were to go. However, farther off there was more open water, and this we reached. During one day and night we traversed a tolerably ice-free sea, but then again had to force our way close along the shore, going on whenever the pack retired a little. The Captain of our other ship was beyond all praise, one might think he neither slept nor ate. Sitting in his look-out in the mast he sometimes took his meal there. On account of his extraordinary skill in ice-navigation he was our leader. During this passage I caught two seals, one Natsek and one Ugsuk. While we thus struggled with drift-ice, new ice began forming, thick enough to be walked over, but at length we came to open sea.

During the night they wakened me and gave me a letter; I directly recognised it to be from Upernivik, from my homestead. When I had read it, I learned that my wife and children were well, and now I felt consoled. We proceeded against a southerly wind and searched for whaling vessels on their fishing grounds, but did not see any. We sighted land about Tasiusak and tried to touch at Natsilivik, where lived natives, but were obliged to turn seawards, and to my disappointment passed Upernivik without approaching the coast on account of the heavy gale. When the wind abated we landed at Kekertarsuak [Disko].

Here I was allowed to remain, and I felt consoled to know that I could stay with the Inspector, as he was very friendly towards me. He desired me to write what I had seen, and though unskilled in composition, I have tried to give this account of my voyages, while engaged thrice with the Americans and once with the Tuluks. Four times in all I travelled to the North.

And now I bid farewell to all who have read my little tale. I minded my business, sometimes under hardships, sometimes happy. May all who read this live happily in the name of the Lord!

Written in the year 1877.

DOUBLE DELTA OF THE WHANG HO, OR YELLOW RIVER IN CHINA.

THIS erratic river has made for itself the unusual, if not unique geographic feature of forming two deltas by the sedimentary deposit of its turbid waters. From a given point in the lower course of the stream, the channel bifurcates almost at right angles, each extending for a distance of more than 300 miles, through the alluvial seaboard of Northern China. Bifurcation itself is no isolated feature in the river systems of the earth, which is exemplified in the Orinoco of South America, where a branch of that river, named the Casiquiare, mingles its waters with those of the Amazons, through the Rio Negro. But in that and other examples of streams dividing into forked branches the channels continue supplied with water from the main river. The remarkable phenomenon, therefore, of the Yellow River, is the fact that when one channel is thoroughly charged with the supplies from the upper sources, the other is waterless, and forms a dry bed, abandoned by the native shipping, while it is available for land traffic only.

As the length of these two channels from their point of departure approximate, so does the area of each delta, the one trending in a south-east, and the other in a north-east direction. However, without being too precise, we may appropriately denominate the former the Eastern Delta, and the latter the Northern Delta of the Whang Ho,* commonly called "China's Sorrow," in figurative language, as the most wayward child among her numerous and noble family of rivers. Ever since Europeans have been at all conversant with the topography of China—now more than three centuries—the south-eastern channel which disembogues into the Whang-Hai, or Yellow Sea, has been the recognised course of the river, on maps and in gazetteers, until recently, when the fact was ascertained that the embouchure had shifted to the Gulf of Pe-che-lee, along its north-eastern channel, the two outlets being separated from each other by a distance of not less than 640 miles along the coast line round the rocky promontory of Shan-tung. The intervening region being of a bold, mountainous character, naturally divides the main current of the river, and prevents the amalgamation of the dense sediment deposited by its waters, so that the two deltas are distinct in their alluvial lands. At the same time, the entire area of plains and hills within the boundaries of this binary delta, from the angle of bifurcation, assume an oblong form approximating to 70,000 English square miles. The sub-divisions are nearly equal, allowing one-third for the hilly peninsula, and the same for each of the deltas, which assume more or less the usual triangular form.

On referring to a map of China with the highlands of Shan-Tung well defined down to the frontiers of the lowlands, the cause of this deltaic phenomenon is abundantly evident. In accordance with the Chinese system of topographical nomenclature of the eighteen provinces, which is based upon their geographical characteristics and compass direction, Shan-Tung literally translated signifies "Mountain-East," but as the two Chinese characters are read from right to left, their proper interpretation means "East Mountain," or freely rendered the Province of Eastern Mountains. At present the rocky region which gives its name to the province, forms a conspicuons peninsula of not less than 23,000 square miles, and there are sufficient data in the surrounding plains to the south and north-west, that at no distant geological epoch, these were under the sea, and the hill country formed an island in the Whang-Hai, or Yellow Sea, about two-thirds the size, of Ireland.

We are not in possession of any historical data to infer that it was an island when the country was first occupied by the ancient Mongols; but the following significant passage occurs in Ogilby's translation of passages from the writings and journals of Arnoldus Montanus, being the second part of the *Atlas Chinensis*:—"Xantung, the fourth in number among the Northern Provinces, may justly be esteemed a great Island, being on the North, East, and South wash'd by the Sea, and on the West by several Rivers, so that it is round about Navigable." This writer accompanied the early Dutch embassies to Peking in the beginning of the seventeenth century, when they had audiences of the Emperor Kang-Hi, and the "Netherlanders assisted the Tartars against Coxinga, and the Chinese Fleet, who till then were Masters of the Sea." However, he does not mention whether he personally visited Shan-Tung, on which his description of the province is based, or whether he obtained it from the "Chineses," in their ancient topographical works. We incline to the latter supposition. Be that as it may, there were about this period, in the Imperial Library at Peking, maps of the empire, showing that the peninsula of Shan-Tung was only separated from the mainland by a narrow neck not more than 5 leagues wide, and the greater part of the two deltas formed deep gulfs. Of these maps a copy appears in the English translation from the Italian of a work on China written by Alvarez Semedo, a Portuguese Jesuit Father, "after he had resided twenty-two years at the Court, and other famous Cities of the Kingdom." On the map the following note is inscribed:—"An exact Mapp of China, being faithfully copied from one brought from Peking by a Father lately resident in that Citty." This, we presume, was Semedo himself, whose work treats but little on the geography of China.

Although the Chinese, from time immemorial, have zealously studied the geography of the empire—which forms one of the chief subjects of the literary examinations—and the divisions of executive government

* *Ho* is the Chinese for "River" in the northern provinces, and *Kiang* in the south; hence it is also named Ho, *par excellence* just as the Yangtsze is termed the Kiang.

throughout the provinces are based upon a comprehensive topographic system, still they have been always deficient in correctly surveying the country, or delineating its features upon maps. Hence the wise Emperor Kang-Hi, seeing that the Jesuit Fathers were capable of performing the task which the most talented of his subjects could not undertake, employed them in surveying the empire, which occupied twenty-seven of them, with large staffs of native assistants, upwards of eleven years in traversing the realm, and four years in mapping it out; the result of which we find in the well-known work of Du Halde, where the numerous maps and topographical descriptions have in a great measure formed the basis of European maps of China, and do so at this day in delineating the inland provinces not yet visited by our maritime surveyors. The map copied by Semedo from the original at Peking was, doubtless, one of the ancient maps, which the Jesuit survey superseded, and many centuries old. We have seen others of equally ancient construction of the provinces separately, and, on all, the attempt to reduce them to anything like a correct scale is miserably deficient. This is especially the case in laying out the relative areas of land and water, and giving undue prominence to the dimensions of the great rivers. Probably this arose from the Chinese being essentially a maritime people. It was considered more important to show the water communications of the country than the roads, for the purposes of traffic. Be that as it may, the preponderance of water over land in Semedo's map is so great as to render its evidence of the Shan-Tung peninusula assuming an island form within the Chinese historical period exceedingly vague; although, no doubt, the "Bay of Hang," now the Gulf of Pe-che-lee, reached many miles inland from its present shores, and so also the "Bight" of Whang-Hai.

Turning our attention to the unwritten geological record, there are indubitable data in the formation of the alluvial lowlands round the rocky highlands, that the latter formed a natural barrier to the onward flow of the Yellow River, and the triangular wedge-shaped form of its mountain chains, divided equally the deposit of deltaic sediment along their flanks, and thus established the unique hydrographic basis of a double delta. In this instance, we have an example of the formation of sedimentary strata on a vast scale, and in a comparatively rapid course of time, on account of the unusually large proportion of yellow sediment *in situ* brought down from the Ortous plateau at an elevation of 8,000 feet, and rushing along impetuously at rates ranging from 5 to 9 miles an hour, even at its lower course, where the gradient is much less than along the upper courses. On this head, Arnoldus Montanus observes:—"This river at first sight seems to be a pool of flowing mud, but the swift current of its waters manifests the contrary. Those that frequent this river make the water clear by casting in allom, which drives the lees to the ground, and fills the fourth part of the vessel. It is a great wonder from whence such abundance of clay or mud proceeds, considering that it never hath been seen clear or bright; nay, the *Chineses* say, that its waters cannot be cleared in a 1000 years, insomuch, that they have a proverb from thence amongst them, *viz.*: when they speak of things that are never likely to happen—as altogether impossible—they say, '*When the Yellow River shall be bright.*'" On some of the native maps the course of this turbid river, from its sources in the mysterious region of fabulous spirits and genii, among the snow-covered mountains which form the western boundaries of Koko-Nor, to its old embouchure into the Whang Hai, it is painted of a yellow tint, to give significance to the peculiar colour of its water; occasioned by the yellow mud, or clay earth, which from the spring to the sea it glides over, and carries along in its erratic course.

Sir John Barrow, private secretary to the Earl of Macartney and one of his suite, when that n obleman was Ambassador from George III. to the Emperor Kien-Lung in 1793, took great interest in the geographical phenomena presented by the Yellow River, examining these with his well known acumen. Regarding the nature and extent of the deltaic deposits, he entered into the subject in a practical manner with the following results:—

"To avoid all possibility of exaggeration, let it be supposed that the breadth of the Yellow River, where the Embassy passed it, was only three-quarters of a mile, the mean depth 5 feet, and the velocity of its course 4 miles an hour. From thence it follows, that in every hour, there is discharged from that river into the Yellow Sea, a volume of water equal to 418,176,000 solid feet, or 2,563,000,000 gallons of water, or 1,100 times as much as appears to be furnished by the Ganges. In order to be able to form some idea of the quantity of mud suspended in the water of the Yellow River, the following experiment was made:—A gallon and three-quarters, ale measure, was taken out of the middle of the stream where it was running at the rate of 7 or 8 miles an hour, and at a depth of 9 feet, deposited a mass of matter, which, when compact and pressed into the form of a brick, was equal to 2 solid inches and a third. The sediment of which this mass consisted, was a fine loamy mud of a yellowish tinge, which when dry is reducible to an impalpable powder by rubbing it between the fingers. . . . According to the method followed as to the water of the Yellow River, it appeared to contain of mud, but a two-hundreth part of the original bulk. A considerable portion of the mud must have, indeed, been wasted, from the nature of the experiment. According to this proportion, however, of mud suspended in the waters of the Yellow River, a quantity equal to 3,420,000,000 solid inches, or 2,000,000 of solid feet of earth is wafted to the sea in every hour; or 48,000,000 every day; or 17,250,000,000 in a year. Supposing the mean depth of the Yellow Sea to be 20 fathoms, or 120 feet, and it was seldom found to be so much, the quantity of earth brought down from the Yellow River, would, if accumulated together, be sufficient to fill up, even to the surface of the sea, an island 1 mile square in 70 days. By extending the calculation, a curious enquirer may find in what space of time the Yellow Sea itself might be filled with the successive depositions from the Yellow River alone; for supposing that sea to extend northward from the river, and to include the gulfs of Peche-lee and Lea-tong, the number of square miles on the surface of this extent, would be about 125,000, which multiplied by the number (seventy) of days necessary for consolidating 1 mile square, would make 8,750,000 days or 24,000 years." Without entering into the details of Sir John Barrow's experiments and

computations, there can be no doubt that the shifting of the outlet of this rapid land-forming river from the Yellow Sea to the Gulf of Pe-che-lee will materially assist in the increase of its shallow waters, already extensive from the dark muddy deposits of the Pei-Ho, or North River, with impeded navigation to Tien-Tsin, the river port of Peking.

When that anomalous geographical change commenced we have no exact data to rely on, yet there is sufficient from the testimony of recent European travellers in Shan-Tung and the Kiang-Soo northern districts, to furnish a reliable account of the phenomenon, and the period when it occurred. Before entering upon that branch of our subject we will briefly refer to what has been stated by foreign writers, on Chinese authority, regarding the changes and inundations of this remarkable river. On the copy of the ancient Chinese map referred to in Semedo's book, the lower course of the Yellow River has the embouchure of the main stream on the shore of the Yellow Sea, where its channel has inter-communication with that of the Yangtsze Kiang, with smaller intervening rivers, the whole forming a series of ramifications between the two gigantic streams which separates the alluvial seaboard into fourteen large islands. As already remarked, we do not place much confidence in this rude sketch map; but as it must have been projected before the construction of the Grand Canal by Ghenghis Khan in the beginning of the thirteenth century, it points out an interesting fact in the ancient topography of Kiang-Soo, namely, that the two deltas of the Yangtsze Kiang and Whang Ho were assimilated by the sediment of their united waters, or, rather, that section between the north bank of the former and the south bank of the latter. At the same time, this map shows that the Yellow River had a branch flowing through Shantung, much in the same course as the present channel, but with two mouths, from a bifurcation beginning about half the distance. Moreover, there is another subsidiary branch laid down, connected with the river system of the Pei-Ho; showing that at one period, within the antique historical era of China, the whole of this vast systems of rivers were linked together by a chain of outlets and channels that has no parallel in any other region of the world. That the basis of this map was founded on fact is partly confirmed by the geological evidences of the deltaic formations now seen in the same latitudes; while the native boat traffic throughout the entire area—irrespective of the Grand Canal and smaller artificial channels—shows that there remain vestiges of the ancient river-courses. Moreover, there are documentary data, translated from the ancient Chinese classics by learned sinologues, especially in the writings of Confucius and Mencius, which go to support the topography of this and other antique maps, that the lower channel of the Yellow River has altered from time to time during the course of centuries back to the period of Yaou, something like 2000 years before our era, to which the Chinese carry back their tradition of a devastating flood over the northern delta, which was relieved by the engineering genius of the great Yü, whom Mencius states "opened nine channels," and was eight years engaged in regulating the waters, so that the inhabitants returned to their renovated dwellings in safety.

Although not specified, where he states that by his works he "led them to the sea," we may infer that the main channel was carried through the eastern delta, recently deserted by the Whang Ho, and consequently the river has returned to its early natural channel. Further, there is both written and geological evidence that it has alternately visited the shores of the Yellow Sea and the Gulf of Pe-che-lee at intervals of time more or less regular. The distance from the City of Kai-fung, below which the double delta begins, being approximately the same, it is logical to infer that the changes have been alternate and equal in time. Moreover, it is not to be supposed that this deflection of a great river, estimated at 2480 miles in length, about a mile wide, and twenty feet deep in mid-channel at the angle of bifurcation, could be effected by one fell swoop of its current during a year or so. Like all mighty transformations of submerged regions into dry land, and *vice versa*, no doubt these changes were gradual, and spread at each recurrence over a term of years. There can be no doubt, however, that they have been more rapid than under ordinary riverine phenomena, in consequence of the strong and dense sedimentary volume of water carried along tumultuously to the sea by the Whang Ho.

These remarks lead us to the consideration of the time and circumstances, attending the change of the river bed from its eastern to its northern delta. On this head the data is not so precise as might have been expected, especially as it must have occurred between fifteen and twenty years ago, but our wars with China, and the internicine strife of the Taiping rebellion, during that period, absorbed the attention of both natives and foreigners, to the exclusion of all peaceful investigation of natural phenomena. Since the cessation of these foreign and civil wars in the maritime provinces, travellers have been enabled to visit this interesting region, a British settlement has been established in Shang-tung, and Protestant missionaries allowed to pursue their peripatetic labours, who have thrown light on this interesting subject.

Those who have perused the graphic narratives relating the progress of the embassies of Macartney and Amherst, both of which crossed the Whang Ho, will have noticed that the Yellow River was in full flood along its straight channel through the eastern delta to the Yellow Sea. Staunton, Barrow, Abel, and Davis each describe the turbulent stream as it was, and only casually refer to the old Chinese maps and annals, where it "has been represented as flowing into the Gulf of Pe-che-lee, *north* of the Shan-tung Promontory," as Sir John Davis has it. It was in 1816 when he saw it, but, though there are no subsequent minute descriptions of the river, yet there is later evidence, on the best authority, that it had not altered its course thirty-five years afterwards. From these we select the account of the eminent American topographer and sinologue, S. Wells Williams, who writes as follows in the *Chinese Repository*, Vol. xix.:—"There are many reasons for supposing that the Yellow River once flowed through the Wei Ho, into the Gulf of Pe-che-lee, and that the deluge of Yü, spoken of in the Book of Records, was an inundation of the Great Plain by the forcing of the present passage. . . . . At present the Hwang Ho runs in one channel eastward, and near the town of Kaifung-fú it borders on a very flat country, which is exposed to occasional overflowings. As the adjacent

country is very low, it was at an early period considered necessary to protect against the inundations by dikes built of quarried granite of great strength. These dikes extend about a hundred miles along the southern banks of the river. This had the effect, which has also been experienced in the Po and Rhine, of raising the bed of the river, so that even when the river is low, its surface is considerably above the adjacent plain, This plain, whose soil is exclusively formed by alluvial detritus is of extraordinary fertility, and covered with almost innumerable villages and towns. When, therefore, the river being unusually swollen, breaks through the dikes, the loss of life and property is immense."

That account was published at Canton in September 1850; after which, to the close of the following year, a monthly "Journal of Occurrences in China" is recorded, but no mention is made of any unusual alteration of the lower course of the Whang Ho, so that we may accept it as a fact that the river was running in one channel eastward during 1851. We now come upon data furnished by D. J. Macgowan, M.D., an American medical missionary, well versed in the Chinese language and of scientific acquirements, as shown in many valuable contributions to periodicals on the geology and natural history of the country. In one of these, published in a Miscellany at the *North China Herald* office, Shanghai, for 1857, and headed "Notes and Queries on the Drying up of the Yellow River," the following remarkable statements appear:—"In the latter part of 1852 the people of Whai-ngan found the river fordable. In the spring of the ensuing year travellers crossed it dryshod. Since that time it has been—to use the Chinese term applied to it—'as dry as dust.'" This city is situated on the Grand Canal, within about 20 miles of its intersection of the Yellow River, and 80 miles from the embouchure into the Yellow Sea. It is the chief city in the Department of Whai-ngan, Province of Kiang-Soo, and was formerly in danger of being submerged, for the ground on which it stands is lower than the canal. "Six miles off," says Du Halde, "it has a borough named Tsing-kiang-pú, which is, as it were, the port of the Yellow River, large and populous; and there resides the Surveyor-general of the rivers" and canals.

In corroboration of his statement that the waters of the Whang Ho had disappeared from its lower channel, Dr. Macgowan cites the evidence of a native eyewitness, formerly belonging to the above-named department, who had entered into the service of the American Mission, to which he was attached. "We have in our employ," says Dr. M., "the former Secretary of the Commissioner of the Grand Canal, who resided in Whai-ngan from February to September 1853. Nearly the whole of the following year he spent further up the river, at Süchaŭ (Sui-cheu, 50 miles above the junction). The dryness of the channel at the former place attracted his attention, but he found prevailing such a superstitious dread of the subject, that people avoided conversing about it. It was believed that even politics might be discussed with less danger; the fear being that if not let alone altogether, the dangerous stream might re-appear, and with greater power. At Süchaŭ, (says our informant,) only a few puddles might be seen (in the river-bed) and a rivulet which a child could ford." When we contrast this diminution of a mighty stream ranking among the greatest rivers on the terraqueous globe, it confounds all our previous convictions of fluviatile permanency, the very prospect of such a phenomenon befalling any of the great European streams, or even our comparatively small rivers, would be of incalculable injury to the adjacent country, and to maritime traffic.

At this point it may be appropriate to quote Sir John Davis's account of the river and canal at their junction to illustrate the volume of rushing waters, which was in the course of a few years reduced to driblets. "On our left (proceeding south)," he narrates, "was a stream called the 'New Salt River,' which, like the canal, opened into the Yellow River; and on our right we had for several days very close to us the Yellow River itself, which just before this point of junction with the canal suddenly turns north-eastward, after having run in a south-easterly direction. When we had been a short time at anchor, during which interval some of the chief mandarins visited the ambassador, we all got under weigh, and prepared to cross the famous Hoang Ho. All the boats, on entering the river, struck right across the stream, without observing any order, and gained the opposite bank in less than an hour. . . . . The breadth of the river in this part was about three-quarters of a mile, the direction of the stream north-east by east, with a current of 3 or 4 miles per hour. . . . . The stream was certainly violent, and carried us down a considerable way before we could reach the opposite bank, which was lined with a great number of boats of various shapes and dimensions, some of them being constructed exactly in the form of oblong boxes. Many of these were stationary, and laden with straw or stalk of the *holcus sorghum*, and with coarse reeds ready to be transported to different parts of the river and canal for the repair of the banks. . . . . When the current had carried us down some distance to the eastward, we had a mile or two to re-ascend the river, before we came to the opening through which we were to pursue our route to the south; and the passage in the vicinity of the bank, to which we kept, on account of the current, was so obstructed with boats that this was not effected under four hours from our first getting under weigh. The worst part was now to come, in passing through a sluice on the hither side of the water, which had been confined in its passage through the abutments, raged with such fury as to suck down large floating substances in its eddies. This sluice, upon a large scale was near 100 yards across, and through it the waters rushed *into* the river, at the rate of not less than 7 or 8 miles an hour." Yet this vast volume of water entirely disappeared between the years 1852-54 according to the testimony of Dr. Macgowan's native informant, which there is no cause to doubt; so that the broad, deep, impetuous expanse of waters between the banks of the Hoang Ho and its mouths disappeared, while the river bed became "as dry as dust." To realise such a remarkable phenomenon among the rivers of Europe, we may suppose the Danube dried up in its lower course so as to be crossed on foot at Galatz, and then striking out a new channel west of the Balkan mountains, changing its embouchure from the Black Sea to the Adriatic. This strange, mysterious fluviatile phenomenon exercised a similar reticence on the Govern-

ment as it did on the people, and the subject was seldom referred to in the *Peking Gazette*. All that the learned Doctor could find was a notification in an issue of May 1856, wherein "the Commissioner having charge of the lower portion of the Whang Ho, reported that out of twenty-two *ting* under his jurisdiction, nine were entirely dry." During the same month, "the Emperor, in a sentential document enumerating the calamitous occurrences of his short reign, says, "*The* river does not flow as hitherto," evidently regarding that as an evil omen. He adds, that perhaps a careful search of the *Gazette* might throw more light on the subject, the foregoing being all that he had noted.

We now come to consider a still more remarkable phase of this fluviatile phenomenon, advanced on the authority of Dr. Macgowan and his Chinese informant, that while the Yellow River had disappeared from its eastern channel, leaving the delta dry, there were no data to show what had become of the erratic waters. "We have, indeed," he states, "received verbal accounts from travellers, to the effect that the stream now passes through the prefecture of Tsauchan, in the S.W. part of Shan-Tung, and thence as of old, in what particular way is not stated, to the Gulf of Pe-che-lee. On the other hand, the above-mentioned secretary states that in his journey from Peking to Whai-ngan, made in February 1853, he found, from Tientsin to that point on the canal where it receives the waters of the Yun Ho, less water than usual, and from thence, where the current turned in his favour, the quantity of water in the canal became less and less, until he reached its junction with the Yellow River, where it was dry. Moreover, the waters were nowhere less pellucid than ordinary. From various other sources we have received similar accounts, which, like this, palpably contradict the statements which represent the Whang Ho as having taken a north-east course." Nevertheless, and notwithstanding the learned speculations of the *savant*, which include subterranean agencies from earthquakes which happened about that time, we have now the broad, palpable fact before us, through the testimony of unimpeachable travellers who have visited and navigated the new lower course of "China's Sorrow," which has once more claimed its ancient northern delta as the future field for its fertile, inconstant current.

Shortly after the publication of these particulars the second and third foreign wars distracted the nation, so that little or no notice was taken, by either natives or foreigners, of any changes taking place in the course of the Whang Ho. After peace was proclaimed, in 1860, several British civil and military officers returned south from Peking by way of Shan-tung, so as to embark at the new settlement of Chefoo. Among those travellers was Captain Harcourt, *aide-de-camp* to General Staveley, who wrote a lively and interesting account of his journey, which appeared in the columns of the *North-China Herald*. He and a companion versed in Chinese undertook the trip on horseback, in January 1861, when the Pei Ho and other rivers in these latitudes are frozen over, and the waters low until the melting of the snow in spring. On the 23rd of that month he enters in his journal:—"We left at twelve for Tong-ho, about 20 miles off, and saw a range of hills quite plain ahead; between was a flat country covered with orchards. Came to a river formerly called Ta-tsing Ho, but now called Yellow River; ever since the large river of that name broke into it. Met here 300 Tartar cavalry all mounted on rough strong ponies, on which they jumped into the ferry-boat, which was a few feet from the bank. They crammed as many as eight-and-twenty men and horses into the boat at one time. We went across with them." No further mention is made in the diary as to the width, current, depth, colour, and volume of the river, so that we are unable to estimate the magnitude at this time of the Whang Ho in its new channel as compared with that of the old one at its junction with the Grand Canal near Whai-ngan City. At the same time, on referring to the map, we find that the distance between the old and new junctions along the course of the canal, is upwards of 250 miles, about the same distance the former crossing was below Kai-fung. The new ferry being 120 miles north-east of that city where the river diverges.

Nothing of note transpired concerning the renewed course and amalgamation of the Whang Ho with the Ta-tsing Ho, until 1866. After the suppression of the Taiping rebellion at Nanking and the surrounding country in 1865, the remnant of the rebels who had escaped capture, crossed the Yangtsze Kiang, and proceeded northwards through Honan province into Shan-tung, ravaging the country, and plundering the peaceable inhabitants, without any religious motive for their warfare; and hence they were called Nien-fei signifying "banditti," as they were nothing more than a horde of robbers and murderers. The Imperialist soldiers endeavoured to stop their progress, but were repulsed, and the enemy advanced into the level country forming the northern delta of the Yellow River, and devastated the land throughout its length and breadth. Without entering into details, suffice it to say that the Government at Peking became alarmed, and sent their troops against the enemy who succeeded ultimately in discomfiting him. At the same time the British Consul at Tien-Tsin, requested the Rev. Jonathan Lees, of the London Missionary Society, to furnish him with some account of these new insurgents, about whom he obtained practical information while travelling with a missionary colleague through the disturbed districts. In his reply to Mr. Morgan, H.B.M. Consul, he writes:—"Sir,—At your request, I have much pleasure in placing at your disposal such information as I have lately gained respecting the movements of the rebels in Shantung, and the state of the districts generally. It may conduce to a clear comprehension of the various details if I say a word or two on the geography of the country we have traversed. . . . . 1st. As to geography, going south from this city (Tientsin) along the course of the Grand Canal, it would, until recently, have been found that from a point just beyond the City of Lin-ching in Shantung, the canal bed was dry, at least as far south as the prefecture of Yung-chang, near to which the Yellow River crosses it. The officials have lately filled this dry channel for strategetic purposes, by breaking the south bank of the river at this point, thus diverting a large body of water in a north-easterly direction, and thereby separating this part of the sea-board from the interior. The enclosed district has well defined boundaries, having the Peiho on the north, the canal upon the west, the Yellow River upon the south, and the sea

upon the east. The Yellow River has adopted the bed of the river variously known as the Ta-chi, Ta-ching, or Yon-ho, and thus pursues a north-east course north of the provincial city of Chi-ngan, passing the cities of Chi-yang, Chi-tung, Pu-tai, and Li-chu, all of which are on its banks, and falls into the gulf beyond Li-chin. The northern part of this district is the least interesting. Near the sea it is marshy, and sparsely peopled, but the southern half is very fertile and studded with villages, and level as a chess-board. The mass of the population are poor, but there are many wealthy proprietors, and a fair average of educated men. Excepting Te-chin, Lin-chang, Tung-chang, and Wu-ting, the cities are comparatively small, and more or less decayed."

About the same time, or shortly after the journey of the Rev. Mr. Lees, and his colleague the Rev. I. Innocent—who were robbed by the rebels and their lives endangered—the Rev. A. Williamson, of Chefoo, another indefatigable missionary, traversed this alluvial region, now becoming famous geographically as the old northern delta of the Whang Ho. The result of his observations were read at a meeting of "The North China Branch of the Royal Asiatic Society," held at Shanghai on the 13th March 1866, when the first portion of a paper, entitled, "Notes of a Journey from Peking to Chefoo, *viâ* the Grand Canal," was communicated by the secretary. In it he described the canal as being in excellent repair as far as Lin-tsing; and crossed the Yellow River, where it was much broader than the Thames at London Bridge. Having attempted to fathom it in the centre he could find no bottom, not, however, because of the depth, but the force of the current. Since then all these and other interesting details of this wayward river and its Shan-tung Delta, are graphically described by Mr. Williamson in his interesting work, entitled, *Journeys in North China*. The information contained in the paper read at the meeting came upon the audience as a matter of surprise, and one member of the society expressed himself so far as to consider it a "discovery." In like manner the foreign residents generally, at the treaty ports, took considerable interest in the new topography of Shan-tung, and some of the merchants resolved to send an expedition to explore the new outlet of the Whang Ho into the Gulf of Pe-che-lee, for mercantile purposes. The result of that journey, and the comparative resources of the new or Northern Delta with the old or Eastern Delta may form the subject-matter of a second paper on the Double Delta of the Whang Ho.

SAMUEL MOSSMAN.

THE BEGINNING.

GRUITHUISEN.

Two eminent astronomers publish to the world their ideas of world-making—one makes a molten earth, the other a cold earth. They cannot both be right. One formed his world by force, one without it. One earth was formed rapidly, one slowly; the latter by a German, the former by a Frenchman. Both have their disciples, but English science believes in the latter. We call the theory of Laplace "the Nebular hypothesis," and that of Gruithuisen "the Aggregation theory." Neither gave the origin of matter; one calls it dust, one a nebula. As far as our means allow, we wish to discover the condition of matter previous to the construction of this earth, as well as the manner of its construction. The subject resolves itself into two simple questions—First. What was the previous condition of the material used in the construction of this earth? Second. How did this material become consolidated into the nucleus of this earth?

First. Looking to that part of the earth's surface with which we are all more or less acquainted, we find that it is composed of hard or soft materials, representing compositions of organic and ingoranic dusts, and containing minerals and metals. These materials were left in their varied formations, as sedimentary deposits by water, or as wind drifts. Except as bones, shells, and some perfect vegetable fossils, we find no formation in any way identical with the organic remains that formed it. Under the influence of air and water, heat and cold, all organic matter undergoes decomposition and chemical changes. Organic and inorganic formations undergo another great change by the percolation of water through the mass, carrying with it certain soluble portions from one part to another, so that some parts of a formation may be changed by the loss of original material, while other parts are changed by the addition of its own constituents, or by other matter brought in by water. In whatever condition we find materials, organic, or inorganic, we know that they must have had an origin. Our organisms are supposed to originate in air, water, and dust; they return to these elements again. As far as man knows there was a time when no organisms existed. It is commonly supposed that the first germs were nourished and matured by the inorganic elements of earth, in their trinity, under the influence of light and heat. In the organisms thus produced, we do not recognize inorganic matter, otherwise than by analysis; and, in the inorganic materials of earth, we cannot detect the germs or the direct origin of the organism. We know that the materials of earth are constantly changing their apparent conditions, and that specific organic dusts are mingled with, and lost to sight amidst the materials around them, as thick vapours are lost in the surrounding atmosphere.

In this perpetual change we need not suppose that the nucleus earth represents to us now the visible condition of the material from which it originated, any more than the complete creature represents to us the liquid of the womb from which it came. As far as man knows, our primary rocks are composed chiefly of silicious material of varied aspect. They give evidence in their formations of external forces acting on correlative matter. As the matter and the forces varied, so the condition of the mass varied in hardness or softness, in fracture or cleavage, in retention or non-retention of water or gas. Under manipulation this primary rock is convertible into dust, mud, metal, ashes, and vapour, or many other things. In these changes the natural constituents of the mass become separated, the solid parts tell of the materials which belong to dust; muds and vapours reveal the water and the air. If we continue these manipulations and examinations we extract coloured vapours from known materials; even when these materials are not visible to the eye, careful analysis detects them, but man has no

means of analysing so carefully as nature. The spectrum analysis has disclosed this faculty in the celestial atmospheres that are occupied by vapour lines, giving out the colours of known materials. From these facts we infer that celestial bodies are composed of materials, similar to those of our earth. It has been shown that these vapours are composed of varying ingredients, much in the same way as various ingredients are found in the strata of this earth. If these vapour lines in the celestial atmospheres emanate from the bodies enveloped by them, then those bodies are formed from materials that can be vapourised; or if those bodies are formed from the vapours that surround them, the vapours can be consolidated. In either way we get evidence that vapours and bodies are closely related to each other. We may therefore assume that this earth, being one body of our solar system, may be composed of materials that were previously in a vapoury condition. As far as man has yet gone into these subjects, this deduction is fair and clear, enabling us to reply to the first question—

The previous condition of the material used in the construction of this earth was vapour.

We may consider this vapour as equivalent to the nebula of Laplace, and as containing in it air and water, divisible from the more solid material the equivalents to the dust of Gruithuisen.

We now come to the second question, How did this vapour become consolidated?

The answer is to be found in existing laws acting on existing elements. It has been lately argued that the laws of nature are not the same as they once were; but as no new system has been suggested, we must adhere to the old. All that we see or know of give evidence of one continued certain system of cosmical law: the forces and the composition of matter change, but the law does not change. In a late lecture on Science, Professor Tyndall asked—"Has this uniformity of nature ever been broken? . . . . Not to the knowledge of science!" (*The Mail*, 3rd October 1877). As this earth is, then, ruled by laws as old as itself, from which neither mountain nor molecule can escape, we may infer that the same laws ruled the matter-laden vapour while consolidating into the nucleus of this earth. Looking from the surface earth around us to the lowest deposited stratum, we know that all the materials in that depth were either left *in situ* by animal or vegetable, or deposited by wind or water. These elements therefore moved before any material was deposited on the nucleus. All the organic dusts contained in those strata were once parts of organisms formed from elemental matter. Matter therefore existed before any organism. We are not aware of the existence of any organism previous to the consolidation of our nucleus. We may consequently infer that this nucleus, formed from matter-laden vapour, contained in itself the materials necessary for the formation of organic structures, having dust, air, and water in their compositions. We know that these elements are in every present organism, as well as in those that were: we know that the combinations of elementary matter do vary, and have varied in all organic structures, and that consequently these elements were the origin of every organic body. We are thus forced into the conviction, that as long as air, water, and dust have existed, so long must the laws under which they now act have existed; and as the nucleus itself gives evidence of formation and consolidation under the influence of elemental action, we have a right to infer that consolidation took place in the beginning exactly as it takes place now. How is that?

If we begin by the consolidation of organic structures, we lead the way to the consolidation of inorganic matter. The seed of a plant throws out roots and a stem: these are the conductors of moisture from the soil, attracted to the sunlight. Under the influence of warmth the light gases are drawn up through the growing foliage, the heavier gases and the moisture are left, and the plant becomes an organism, consolidated from inorganic elements. The egg of a bird, fish, insect, or reptile contains a more or less liquid material, which, under the influence of external heat, becomes consolidated into the respective organic forms. The womb of the animal contains in it a certain quality and quantity of liquid, which, under the influence of external warmth, becomes shaped and consolidated into the animal form. In the liquid of the womb, the matter of the egg, or the sap of the plant, we do not recognise the consolidated organism; but we know that, under the laws of nature, condensation, formation, and organism must ensue. These condensed materials consist of varied combinations of elemental matter, all originating, as far as we know, from what we call inorganic matter in a more or less liquid condition.

By transferring the causation of organic structures to inorganic matter, we seem to arrive unavoidably on the cause of consolidation in the beginning. We have to assume, with Laplace and Gruithuisen, that there was a mass of nebulous dust occupying a certain space in the firmament. We assume that this space was the same as that now occupied by air, water, and dust. There is no occasion to imagine that this nebulous dust was once a part of the fiery mass of the sun, or as originating in an imaginary disturbance in the universe. We assume an independent space for the mass before it became dependent on the law. We are as ignorant as Professor Allan Thomson of the origin of the nebulous dust. As, however, dust, water, and air are all here, it is fair to assume that these elements existed in a previous nebulous condition, put together as the elements of the creature are put together in the egg or in the womb. Having assumed so much of the unknown, we come to the action of the law upon inorganic matter as now going on, to show that air is attracted to the light, that water is attracted from the dust, and dust is here. Between 1870 and 1873 Mr. J. B. N. Hennesey was engaged in celestial observations on the Himalaya mountains at a height of 7100 feet above the sea. The results were given in No. 5, *On the Atmospheric Lines of the Solar Spectrum*, published by Messrs. Trübner, London. The observations were made when, "the rainy season having passed away, the atmosphere on these mountains is exceedingly clear, so that the sun is bright even to his setting, and a spectrum may therefore be obtained through a long stretch of terrestrial atmosphere." Differences, however, occurred, "in certain parts of the solar spectrum," which are ascribed "in all cases to the influence of the earth's atmosphere. As the autumn advanced, Mr. Hennesey found that a "*haze*" rose from the earth before sunset, "which grew day by day in height until it attained

perhaps 3° or more above the horizon." Mr. Hennesey called this, "my air wall," giving "a visible connection between the air lines and the terrestrial atmosphere." On the mountains of Western India this air wall rises higher and higher as the season advances into the hot weather of April and May, so that the sun sinks into the lurid haze early in the afternoon, and sets above the natural horizon as a monstrous red globe. Following this atmospheric phenomenon into our daily experience, we see, under certain conditions of light, the atoms of dust playing in the sunbeams: the same thing happens in our palaces and our cottages. We see the atoms of dust falling around us, and we know that dust has gathered and consolidated over cities in which man once lived. We see the dust storms and the sand drifts, we know that matter falls in rain, that sediments may be found in dewdrops, matter has been caught on sheets of paper raised in the air, so that we may be sure that dust is sustained in our atmosphere, as vapour, as haze, as nebula, or in an invisible condition.

As dust falls upon earth now, the rain and the dew fall upon it—it settles down by its own gravitation; the sun shines on it, and evaporates its surface moisture, so that, by its natural pressure, by sunshine and moisture, the dust that has fallen either on the surface of dry land, or on the water eventually becomes consolidated. In this consolidation there are as many varieties of firmness as there are of composition; so that as we look upon the heterogeneous character of the earth, we are inclined to attribute the changes to varied laws; but the great law of heat and light, emanating from the sun, rules our elements so beautifully and evenly, that all the changes we see are due to the correlation of varied materials to the varied forces of the law, and not to any change in the law itself.

The complicated duties of elemental matter may be seen in another light, from "Popular Exposition of some Scientific Experiments," *Harper's New Monthly Magazine* for April 1877:—"Nature thus furnishes us with a striking illustration of the transmigration of matter and force. Now matter is in the air, now part of a plant, now back again in the air. The same is true as regards the energy with which it was associated. Derived from the sunbeam, it lay hidden in the plant awaiting re-oxidation, escaping under the form of heat or light, and remingling with the universal cosmic force." The same process goes on with the animal, and so "the same particle is now in the air, now in the plant, now in the amimal, suffering a perpetual transmigration." All this is done by law, acting on elemental matter, which is perpetually consolidated, broken up, and again used in reconstruction. Man is scarcely aware that these changes pass before his eyes in endless array. Particles come and go; they belong to the organic world to-day, and mix with the inorganic world to-morrow: the changes are perpetual. The laws are for ever acting, and the elements are for ever obedient to the laws.

Thus we come back to the unknown matter of this sphere, before light and heat had force enough to give motion or energy to elemental matter, while that matter was in its chaotic, motionless condition of inactivity, typified to us by the fresh egg or the incipient womb; the whole forming a colourless cloud of nebulous character, containing within it the germs of a future formation hidden in its filmy dust. Was this the beginning of the now firm earth, which gives us our food to eat, our water to drink, and our air to breathe? Was this nebulous dust consolidated by one great law, acting on agents, which have the power to separate and assimilate, to construct, destroy, and reconstruct, with a ceaseless energy, but with a harmony only to be found in one Almighty, never-failing rule? Who can say it was not? We dare not say it was! We may, however, say that the atmosphere of this earth does hold, and from its beginning must have held, moisture and dust in one vast embrace. Here we must enter on the ideal. A scanty light and warmth fell slowly, when the nebulous mass was thick and impervious, as Mr. Hennesey's "*air wall*" is now, when light could not shine through it, and the warmth could not penetrate far beneath the surface of the new-found vapour-mass.

The report of the Astronomer Royal on the transit of Venus in 1874, gives the distance of the sun from the earth at "93,300,000 miles" (*Academy*, 20th Oct., 1877). Were the warmth and light, coming from that distance, sufficient to call the elements of this sphere into action? Were they sufficient to give motion to a nebulous mass, occupying a space of some 8000 miles in diameter, and some 25,000 miles in circumference? Did they cause the mass to rotate on its axis, to revolve in a never-ending course round that distant centre, in perpetual obedience to that visible law? Did that law reduce chaos into order? If these things were done, then the minor actions ensued as certain consequences. The lighter gases of the great mass were perpetually attracted to the centre warmth from the nebulous body, till they attained an unknown rarity—a rarity that lost its power of refraction, its sense of warmth, and its power of motion on the borders of the eternal etherial space, where rotation ceased, and air, water, and matter rolled round in ceaseless energy, within the cold embrace of that motionless, lifeless æther, perpetually drawn to and repelled from the light, doomed to those never-ending revolutions which give us our seasons, as the rotations give us day and night. We cannot tell when these actions began, but their beginning was the beginning of the law which rules us now. As the lighter gases rose from the nebulous mass, the heavier atoms perpetually sank towards their own centre of gravity. Thus, with the attraction of external warmth, the atoms gradually lost their correlations in the nebulous mass; the gases assumed the condition of atmosphere and water, the other atoms, deprived of these suspending forces, slowly but surely assumed the condition of solidity. The mass of nebulous dust became more clear on its surface, more solid in the interior. There was a transparent atmosphere, a translucent water; the light and warmth penetrated to the shallow solids, and decomposing and oxidising the atoms, reduced them to a second obedience of water and air. Then came on another series of actions, early winds and waves, with initial currents, on an unbounded water, moved the decomposing beds from one place to another, the ever-undulating waters made an undulating bed; the waters filled the lowest levels, and left the higher levels to form the beginning of dry land. The law still prevails, and these actions still go on. Did they begin

as we suggest? We scarcely expect a dogmatic negative: we cannot give a dogmatic yes. The answer to the second question may, however, be given.

The nucleus of this earth was consolidated, because the gases and the moisture were gradually attracted, and separated from the nebulous mass, while the heavier atoms, slowly but perpetually subsiding to their own centre of gravity, became the solid nucleus of this earth.

The Beginning, thus presented to us, is not yet ended: the light and warmth are here, and all the elements of earth obey their laws while they feel them, and are inactive without them. At a distance of 4 or 5 miles above the sea level, vegetation and life are almost extinct on dry land. At a depth of 4 or 5 miles vegetation and life are nearly extinct in the water. The fauna and flora of this sphere flourish in a sun-warmed belt of 8 or 10 miles deep, leaving a surface margin of 600 or 800 miles unoccupied in the Arctic and Antarctic regions. Our atmospheres are purified and rarefied now, moisture is evaporated and mixes with the air, it is condensed in cold, it falls, and is again evaporated, and separated from the dust of earth by warmth. May we not glean from these facts that the sun is now, and ever has been, the ostensible lawgiver and the moving cause on earth? We may go farther than this, and say—The three elements, dust, air, water, are kept separate and distinct by the continued action of the sun, and by their own obedience to the law. In this obedience they become one cosmical trinity, acting together in wondrous harmony and unbroken consistency, so perfect and so intelligible, that while the earth's elements continue as they are now, and as they have continued through many millions of years, with the sun of heaven giving its light and its warmth unto them, we cannot imagine a break in cosmical order in the future, or back to the beginning.

While thus tracing the inevitable action of cosmical laws, we have before us a dry land full of the dusts of organic forms, passing through grades and strata, their only record. Those forms grew or lived, they breathed the air, they drank the water, and were nourished by the earth; there is no date of beginning or ending of many kinds. At last we come to man, who proclaims his reasoning soul: he has no date of his own beginning; he does not know the origin of organic or inorganic matter any more than Charles Kingsley's "shepherd boy,"* the President of the British Association, or King Solomon. Yet every organism is a type of the cosmical trinity, produced from what we call inorganic matter by warmth and light. We can get no further; we do not know the origin of light, of warmth, of life, of growth; but we know they are inseparable; and so we believe that energy and motion had a beginning in the *nebulous dust* of Laplace and Gruithuisen, at the moment when the mass first felt the influence of light and warmth.

We have not answered the question in the first sentence. We have pointed out how the laws of the present act on present elements. We have claimed for these elements and laws an inseparable beginning. We have shown how the air, the water, and the dust are separated from one another to perform their distinct elemental functions, and are again united in the cosmic trinity. That trinity was in the nebulous dust, in the matter which first came under the law. We cannot tell the origin of the law, or the origin of matter. The great problem is still unsolved. How did the Beginning begin to be?

Until that question is answered truly, all our so-called natural and physical sciences, dealing with the Beginning, or with structures rising from a supposed Beginning, must be ideal. Every present doctrine on these subjects varies with the Doctor, following the example of the widely-varying teachings of Laplace and Gruithuisen.

May we conclude the subject with a word of warning to the public. If there is any truth in what we have written, we come to a point beyond which we cannot see, an utter ignorance of origin. The materialist endeavours to trace all things, even the reason of man, to matter; in doing this, he does not know what matter is: till he knows this, he teaches falsely. When he can tell us the origin of our elemental matter, it will be time to argue the question—God, or no God? Till then, we will believe in the God of our forefathers; in the sun as His agent in our solar system; and in the elements, as ordained by Him to be subservient to His laws from the Beginning to the end.

Since sending this paper to the editor, a discovery has been made which confirms the theory of a slow, cold Beginning—a gradual clearing of the atmosphere, a gradual accumulation of water, and a gradual deposit and aggregation of matter. M. Cailletet and M. Raoul Pictet have converted air into liquid: oxygen and nitrogen have produced water; hydrogen has been converted into visible vapour; and, says the *Mail* of 9th January 1878—"It is obvious that it is only a question of carrying these experiments further, *in order to reduce these liquid gases to a solid form*." We put the question to science—Were not the pressure and the cold, under which the gases were liquefied, present in the dark, cold Beginning, and were not these conditions carried on to the solids, as light and sunshine warmed this sphere?

H. P. MALET.

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* *Lessons in a Gravel-Pit.*

THE COAL-FIELDS OF ASIA. An Extract, Translated from the German of Ferdinand Hochstetter's "Asia: its Future Railroads and its Coalfields." (Simla, 1877.)

THE extent of the coal-fields of the globe, and their possible exhaustion at some future time, is a subject of the highest importance; and it is a matter of congratulation that so learned a geologist as Dr. Von Hochstetter should have devoted his attention to the coal resources of Asia, and to a consideration of how far they may be relied upon to supply the deficiency which must ensue, sooner or later, from the exhaustion of the European beds. Dr. Hochstetter has amassed a variety of most interesting information in his paper, a good deal being derived from Baron Von Richthofen's observations in China, the coal measures of which country are of surpassing richness and abundance. Our general information regarding the Asiatic coal measures is naturally much too vague to form any definite estimate of their extent, but they are obviously large enough to outlast the European ones for many centuries.

PROPOSED CHANGES
IN THE TERRITORIAL BOUNDARIES OF
EUROPEAN TURKEY
MAP ILLUSTRATING
ARTICLES I. III. VI. OF THE
PRELIMINARY TREATY.

SCALE OF ENG. STAT. MILES.
50 40 30 20 10 0 50 100 150

Existing Boundaries are shown thus .....
Proposed ..... " ..... " ..... "

AUSTRIA
HUNGARY
BOSNIA
HERZEGOVINA
SERVIA
ROUMANIA
BULGARIA
EASTERN ROUMELIA
MONTENEGRO
ALBANIA
GREECE
TURKEY IN ASIA
ADRIATIC SEA
ITALY
AEGEAN SEA
SEA OF MARMORA

Zvornik
SERAJEVO
Drina R.
Widdin
Kalafat
R. Timok
Galatz
Portion of Bessarabia
BUCHAREST
Danube River
Giurgevo
RUSTCHUK
Nicopolis
Sistova
Silistria
NISH
Kursul Bare
Krupatz
Ak Palanka
Leskovatz
Pirot
Nishava R.
Prjepolje
Stolac
Novi Bazar
Mitrowitza
Pristina
Vranja
Kalimantzi
Kumanovo
Uskub
Kalkandelen
Dulcigno
SCUTARI
Antivari
Podgoritza
Spuz
Niksic
Korita
Metoki
Dobrudjitza
Tattari
Zabljak
Bjelopavlici
Baba and Bosh ands
Prokletije Pl.
Biskusat and
J. Kastrati
Korab
Yablanitza
Ochrida
Struga
Koritza
Kastoria
Grammos Mt.
SERES
Yahitza
Demir Hissar
Gallico R.
Parga
Besik Gol
Karasu (Struma)
Marbar R.
Bara Gol
Makri
GALLIPOLI
Dardanelles
SMYRNA
SOPHIA
TIRNOVA
VARNA
Burgas
Yamboli
Tatar Bazarjik
PHILLIPOPOLIS
Ishiklar D.
Tchepeli Dagh
Krushova Dagh
Eshek Kaladji
Kurakoloss R.
Arda R.
Tchirmen
Karaja Hamsa
Ahurji
Arnaud-kui
Yerujeh
Sergen
ADRIANOPLE
Lüle Burgas
Tcharlu
Maritza R.
Tchernavoda
Rassova
Baker
Midia
Tulto
Balkan Mountains
Tributary Principality
Accession to Servia
Accession to Montenegro

18 20 22 24 26 28 30

46 44 42 40 38

BESSARABIA

Portion of Bessarabia alienated by the Treaty of 1856.

R. Sereth

RUMANIA

Galatz

Kilia Mouth

Sulina Mth

Tultcha

St Georges Mth

Black Sea

BUCHAREST

Tchernavoda

Rassova

Kustendji

Danube River

Silistria

Widdin

Kalafat

Giurgevo

USTCHUK

Mangalia

Nicopolis

Sistova

VARNA

TIRNOVA

BULGARIA

Balkan Principality

Tributary Principality

SERVIA

R. Timok

NISH

Karaul Bare

Krupatz

Ak Palanka

Kirot

Nishava R.

Leskovitza

Kalimantzi

Miovatzka

Prjepolje

Novi Bazar

Mitrowitza

Ibar R.

Pristina

Vranja

Kratova

Katzanik

Kumanovo

Uskub

SOPHIA

Yanboli

Burgas

PHILLIPOPOLIS

Ishiklar D.

Tchepeli Dagh

Karakolag D.

Arda R.

Tchirmen

Sangila

Kara Hamsa

Arnaud-kei

ADRIANOPLE

Venijeh

Sergen

Hakem Tabiassi

Midia

Lüle Burgas

Tcharlu

Maritza R.

Bosphorus

CONSTANTINOPLE

San Stefano

SEA OF MARMARA

Bara Gol

Makri

GALLIPOLI

BROUSSA

Dardanelles

TURKEY IN ASIA

Aegean Sea

Zvornik

Bat. Zvornik

Rakar

SERAJEVO

Drina R.

Metokia

Gazko

Korita

Bilek

Niksic

MONTENEGRO

Dobrostitza

Spuz

Podgoritza

Tuttary

Babliak

Gusinje

Plava

Rugova

Zlieb

Pukden

Chanzivnik

Baba osh

Bosh osh

Proldeti Pl.

Biskazi osh

L. Kastrati

Antivari

SCUTARI

Dulcigno

Bojana R.

Lim R.

Tara R.

Piva R.

Ibar R.

Ljuma R.

Ljuma Pl.

Ljuberita

Stoinje

Trgovischte

Kadanje

Kirot

Kadanje R.

Stalatz

Sokolovo

Kriva R.

Batinitza R.

Stanitza R.

Katzanik

Kalkandela

Uskub

Kumanovo

Korab

Blackbirds R.

Yablunitza

Ochrida

Starovo

Koritza

Kastorjas

Gramnos Mt

Yahitza, Vanidje Wardar

Wardar R.

Gallico R.

Parga

Besik Gol

Karasu (Struma)

SERES

Parvi-laci

Yenidje

Ardjan

Eshek Kalajli

Krushova Dagh

Rhodope Mts

Tchataldja

Kara Burun

Kara Burun

Kara Burun

PROPOSED CHANGES IN THE TERRITORIAL BOUNDARIES OF EUROPEAN TURKEY.

As Stated in Articles I., III., and VI. of the "Preliminary Treaty of Peace."

THE proposed new boundaries are shown in red on the accompanying map, while the old boundaries are given n blue.

MONTENEGRO.—*Art.* I. "From the mountain of Dobrostitza the frontier will follow the line indicated by the Conference of Constantinople as far as Korita by Bilek, thence the new frontier will run to Gatzko (Metokia Gatzko will belong to Montenegro), and towards the confluence of the Piva and the Tara, ascending towards the north by the Drina as far as its confluence with the Lim. The eastern frontier of the principality will follow this last river as far as Prjepolje, and will proceed by Rozaj to Sukha Planina, leaving Bihor and Rozaj to Montenegro. Uniting Rugova, Plava, and Gusinje, the frontier line will follow the chain of mountains by Zlieb Paklen, and run with the northern frontier of Albania by the crests of the mountains Kopzivnik, Baba-osh, Bor-osh, to the highest peak of Prokleti. From that point the frontier will proceed by the summit of Biskasit-osh and will run in a straight line to the Lake of Tjiceni-Hoti. Dividing Tjiceni-Hoti and Tjiceni-Kastrati, it will cross the Lake of Scutari to the Boyana, the *thalweg* of which it will follow as far as the sea. Niksic, Gatzko, Sponje, Podgoritza, Zabliak, and Antavari will remain in Montenegro. A European Commission, on which will be represented the Sublime Porte and the Government of Montenegro, will be charged with the duty of fixing the definite limits of the principality, noting on the spot in the general map the modifications which it may think necessary and equitable, from the point of view of the respective interests and of the tranquility of the two countries to which it will accord in this respect the equivalents deemed necessary. The navigation of the Boyana having always given rise to disputes between the Sublime Porte and Montenegro will be the subject of a special regulation, which will be prepared by the same European Commission."

SERVIA.—*Art.* III. "Servia is to be recognised as independent. Its frontier "will follow the *thalweg* of the Drina, leaving Little Zvornik and Sakar to the principality, and running along the old limit as far as the sources of the stream Dezvo, near Stoilac. Thence the new line will follow the course of that stream as far as the River Raska, and then the course of the latter as far as Novi-Bazar. From Novi-Bazar, ascending the stream which passes near the villages of Mekinji and Srgovisje as far as its source, the line will run by Bosu Planina, in the valley of the Ibar, and will then descend the stream which falls into this river near the village of Ribaritz. The line will then follow the course of the rivers Ibar, Sitnitza, and Lab, and of the brook Batintze to its source (upon the Grapacknitza Planina). Thence the frontier will follow the heights which separate the waters of the Kriva and the Veternitza, and will meet the latter river by the shortest route at the mouth of the stream Miovatzka, which it will ascend, crossing the Miovatzka Planina and re-descending towards the Morava, near the village of Kalimantzi. Starting from this point the frontier will descend the Morava as far as the River Vlasina, near the village of Staikovtzi. Re-ascending the latter river as far as the Linberatzda, and the stream Kakovitze, the line will follow the Suka Planina, will run along the stream Vrilo as far as the Nishava, and will descend the said river as far as the village of Krupatz, whence the line will proceed to rejoin by the shortest route the old Servian frontier to the south-east of Karaul Bare, not leaving it until it reaches the Danube. Ada Kale will be evacuated and razed. A Turko-Servian Commission, assisted by a Russian Commissary, will, within three months, arrange upon the spot the definite frontier line; and will definitely settle the questions relating to the islands of the Drina. A Bulgarian delegate will be admitted to participate in the work of the Commission when it shall be engaged on the frontier between Servia and Bulgaria."

BULGARIA.—*Art.* VI. "Bulgaria is constituted an autonomous tributary principality, with a Christian Government and a national militia. The definitive frontiers of the Bulgarian principality will be laid down by a special Russo-Turkish Commission before the evacuation of Roumelia by the Imperial Russian Army. This Commission will, in working out the modifications to be made on the spot in the general map, take into account the principle of the nationality of the majority of the inhabitants of the border districts, conformably to the bases of peace; and also the topographical necessities and practical interests of intercommunication of the local population. . . . . Leaving the new frontier of the Servian principality the line will follow the western limit of the Caza of Vranja as far as the chain of the Kara-dagh. Turning towards the west, the line will follow the western limits of the Cazas of Koumanovo, Katzanik, Kalkandele, to Mount Korab, thence by the River Veleshu as far as its juncture with the Black Drina. Turning towards the south by the Drina and afterwards by the western limit of the Caza of Ochrida towards Mount Linas, the frontier will follow the western limits of the Cazas of Gortcha and Starovo as far as Mount Grammos. Then by the Lake of Kastoria, the frontier line will rejoin the River Moglenitza, and after having followed its course, and passed to the south of Yanitza (Wardar Yenidje), will go by the mouth of the Wardar and by the Galiko towards the villages of Parga and of Sarui-kio. Thence through the middle of Lake Besik Gōl to the mouth of the river Karasu (Struma), and by the sea-coast as far as Bara Gol. Then going further north-west towards Mount Tchaltepe by the chain of Rhodope as far as Mount Krushova, by the mountains Eshek Kuladji, Tchipeli, Karakolas, and Ishiklar, and then as far as the River Arda. Thence the line will be traced southwards in the direction of Adrianople by the villages of Sogudlu, Kara-Hamsa, Arnaut-koi, Akarji, and Yenijeh as far as the River Teike. Following the rivers Teike and Tchorlu as far as Lule Burgas, and thence by the River Sudjak to the village of Sergen, the frontier will go by the heights straight towards Hakem Tabiassi, where it will terminate on the Black Sea. It will leave the sea-shore near Mangalia, running along by the southern boundaries of the Sandjak of Toultcha, and will come out on the Danube above Rassova."

Reviews.

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Dr. HUNTER'S STATISTICAL ACCOUNT OF BENGAL*

THE first-fruits of the Statistical Survey of India, under the direction of Dr. W. W. Hunter, are worthy of the grandeur of the undertaking to which we have already invited attention in these columns. The twenty volumes now before us form as splendid a seven years' literary achievement as we know of, and Dr. Hunter is to be warmly congratulated on this additional laurel added to his wreath. Not many men in India or in England would have cared to face the task he has now set behind him, and it may be confidently said that the number of those who could have successfully brought to a conclusion a work of this magnitude in the time stated is extremely limited. Everything was against the worker in this field, and an experienced Indian Governor, still living, pronounced the task, of the completion of which we have visible demonstration, an impossibility. To most men, indeed, it would, we believe, have proved so, but Dr. Hunter has special qualifications for the work for which he was selected. Combined with an acute sense of the comparative value and importance of different kinds of information, he has shown that he possesses powers of assimilation and organization which can only be characterized as wonderful; rare tact in dealing with men whose assistance was essential to success; and—most important, perhaps, of all—an adequate conception of the shortness of life. The great temptation in such a work as this Statistical Account was over-elaboration, and this would have been fatal to the success of the undertaking.

We have on a former occasion† referred in some detail to the numerous attempts made since 1765 (when the Civil Administration of Bengal passed into the hands of the East India Company) to obtain a knowledge of the country and the people. We then tried to show that the failure of these efforts might be attributed to several causes, chief among which were undue elaboration, and want of a single central controlling power. The latter of these causes of failure, which was also undoubtedly the principal cause, was removed by the appointment of Dr. Hunter as Director-General of the Statistical Department in India, with entire control over the operations of the Statistical Survey. The elimination of the other elements of failure was, of course, left to Dr. Hunter, and the successful issue of this first instalment of the work abundantly justifies his appointment, and affords additional evidence, though none is required, that Lord Mayo possessed that most valuable and rare instinct of selection to which Garibaldi has recently so pointedly alluded, and to which the veteran soldier justly attaches so high a value. Dr. Hunter began his work by carefully studying the causes of previous failures, and the *Statistical Account of Bengal* shows how he has profited by the study.

The result being so satisfactory, as we have thus indicated, it will interest our readers to have some account of the plan by which this success has been attained before we enter upon a brief description of the work itself. Dr. Hunter's plan can be best described in his own words. "It was found necessary in the first place," he writes in the preface to the first volume, "to provide that the materials collected by each of the Local Governments should afford a common basis for the comparative statistics of the country, when eventually consolidated into one final work for all India. In the second place, to devise measures for ensuring the compilation of the materials thus obtained within a reasonable time, and on a uniform plan. The District forms the administrative unit in India, and I took it as the unit of the Statistical Survey in the work of collecting the materials; the Province forms a large administrative entity, and was taken as the basis of the organization for compiling the materials when obtained. With a view to securing uniformity in the materials, I drew up, under the orders of Government, six series of leading questions,* illustrating the topographical, ethnical, agricultural, industrial, administrative, medical, and other aspects of an Indian District, which might serve as a basis for the investigations throughout all India. With a view to securing certainty of execution, provincial editors were appointed, each of whom was made responsible for getting in the returns from the District officers within the territory assigned to him, supplementing them by information from the Heads of Departments and local sources, and working them up into the Statistical Account or Gazetteer of the Province. In this way the unpaid co-operation of the whole body of officers throughout the 225 Districts of India was enlisted, the best local knowledge was brought to bear, and in each Province there was an editor directly responsible for the completion of the Provincial Account on a uniform plan and within a reasonable time. The supervision of the whole rested with me as Director-General of Statistics to the Government of India."† The lists of enquiries referred to were circulated by the Bengal Government in 1869—70, and during the next three years the District officers collected the information required in order to reply to them. "In some cases," says Dr. Hunter, "their reports have amounted to several hundred pages for a single district." These reports were tested as they came in by comparison with the returns from adjacent districts, and, when necessary, by personal visits. The proof sheets, after being passed by Dr. Hunter, were read by the Bengal Government, and received the official sanction before being printed.

Such, then, is a brief sketch of Dr. Hunter's plan of operations—a sketch, however, which gives but a faint idea of the amount of conscientious labour involved in the production of these 20 volumes. Great attention has been paid to points of detail which are essential to the practical utility of such a work as this. The plan of each of the 48 District Accounts is absolutely uniform, the subjects treated of being invariably introduced in the same order and under the same general and special headings. Each account of a District is complete in itself, and each volume has its map, its table of contents and its index, while a general and more elaborate index to the whole work occupies 200 pages of the last volume. The advantage of all this is evident. We have said that one of Dr. Hunter's principal qualifications for the task which he has undertaken is an adequate appreciation of the shortness of life, and busy men will know what we mean, and will appraise at its true value the compliment we meant to convey in the expression. This Statistical Account of Bengal is written primarily for men who are, or ought to be, busy—Indian officials of all kinds in Bengal and in England. It will also be read principally, out of official circles, by men

* *A Statistical Account of Bengal.* By W. W. Hunter, B.A., LL.D., Director-General of Statistics to the Government of India. Twenty Volumes. London: Trübner and Co.

† *Geographical Magazine* for September 1876.

* Subsequently circulated to the Local Governments under the title of 'Heads of Information required for the Imperial Gazetteer of India.'

† The above narrative is as accurate as a comprehensive sketch can be made without going into very minute details. Thus, in one Presidency (Madras) a more elaborate system of separate District accounts has been adopted; while the Gazetteers of one of the minor administrations (the Central Provinces), and of the Haidarábád Assigned Districts (the Berars) were commenced and practically done before the introduction of the system above described. Again, with regard to Native States, considerations of public policy have rendered anything like rigid uniformity in my demands for information impracticable.

both in India and this country whose time is valuable and who will be grateful for the uniformity and attention to detail to which we have referred. And it is but natural that the reviewer should lay special stress upon an apparently small point which nevertheless greatly facilitates his task. A very cursory examination of the work will show the reader what we mean; and, if, besides being a reader, he is a student, he will rapidly discover that for purposes of comparison this uniformity is not only extremely valuable but absolutely essential.

The principal general headings under which the information given in each district is ranged are:—Topography and General Aspects—The People—Agriculture—Natural Calamities—Means of Communication—Manufactures—Commerce, &c.—Administrative, &c.—Meteorological and Medical. The manner in which these headings are amplified and subdivided may be most simply shown by noting the chief sub-headings of a District Account. Taking, for example, the District of Cuttack (Vol. xviii), we find in the index the following headings (we omit the page references):—

Cuttack District.—Geographical Situation, Area, and Headquarters; Boundaries; Jurisdiction; General Aspect of the District; Hills; River System; Estuaries and Harbours; False Point—History of the Harbour; Its Trade; Its Future Capabilities and Improvements; The Bráhmaní and Dhámrá Estuaries; Distribution and Control of the Water Supply; The Orissa Canal System (High Level, Kendrápárá, Táldandá, and Máchhgáon Canals); Irrigation Capabilities; Financial Aspects; Embankment; Utilization of Water Supply; Fisheries; Lines of Drainage; Jungle Products and Pastures; *Feræ Naturæ*; Population—Early Estimates; Census of 1872, its Agency and Results; Classification according to Sex, Religion and Age; Infirms; Ethnical Division of the People; List of Hindu Castes; Aboriginal Tribes; Religious Division of the People; Division of the People into Town and Country; Cuttack (Katak) City; The Citadel of Cuttack; Jájpur; Sivaite Temples and Sculptures; Kendrápára; Jagatsinhpur; Antiquities of the Cuttack Hills; Material Condition of the People—Dress, Dwellings, Food, &c.; Agriculture—Rice Cultivation and List of Crops; Other Cereals; Pulses and Fibres; Miscellaneous Crops; Cultivated Area and Out-turn of Crops; Condition of the Peasantry; Rent-law; Domestic Animals; Wages and Prices; Agricultural Implements; Weights and Measures; Landless Labouring Classes; Land Settlement; Land Tenures—Tributary States, or *kilajáts*; *Zamíndárs*; Intermediate Estates, paying Revenue through the *Zamíndárs*; Resumed Revenue—Free Tenures; Quit-rent Tenures; Cultivating Tenures; Religious and Charitable Tenures; Service Tenures; Rates of Rent; Manure, Irrigation, and Rotation of Crops; Natural Calamities—Blights, Floods and Droughts; Famine Warnings and Preventive Works; The Famine of 1866; Road and other Means of Communication; Manufactures; Commerce and Trade; History of Orissa—Pre-historic Period: The Buddhists; The Sivaite Dynasty; The Vishnuvite Dynasty; The Muhammadan Conquest; The Marhattá Rule; The English Conquest; Revenue and Expenditure; Land Revenue; Civil and Criminal Courts; Police and Jail Statistics; Educational Statistics; Postal Statistics; Administrative Divisions; List of *Parganás* with chief Villages in each; Climate, Temperature, and Rainfall; Endemics and Epidemics; Charitable Dispensaries; Cuttack Lunatic Asylum; Vital Statistics; Fairs; Cattle Disease; Indigenous Drugs.

A similar list of references, *mutatis mutandis*, is found against the name of each of the forty-eight Districts of Bengal in the General Index; and as the whole work has been planned by one mind and upon one unvarying system, with a view to comparative study, the difficulties in the way of reference are reduced to a *minimum*. It is hardly necessary to say that the skeleton analysis given above affords a very inadequate notion of the amount of labour which has been devoted to the work; and it is impossible for us in the space at our disposal to give anything but a general idea of the manner in which the skeleton is clothed. It is almost universally supposed, and not without reasonable and good foundation, that to make statistics interesting is an impossibility, but Dr. Hunter has in this work disposed of more than one "impossibility" and we venture to affirm, without much fear of contradiction, that if the incredulous reader will devote a couple of hours to the sixth volume of this *Statistical Account of Bengal*, (dealing with the Districts of Chittagong, Noákhálí and Tipperah, the State of Hill Tipperah and the Chittagong Hill Tracts) he will admit that statistics are not such dry reading after all. Although "historical disquisitions or opinions on the social and economic conditions of the people were deemed unsuitable in a work which was to be revised by the Government and to receive its official imprimatur," Dr. Hunter has not failed to light up his pages whenever occasion offered, and his volumes contain much that is extremely interesting even to the ordinary reader. This remark applies in a special degree, perhaps, to the sections on the People. We are first told their numbers, and after we have followed them through all their subdivisions—according to race, caste, religion, sex and age—we are presented with a picture of them in their homes; their dwellings, furniture, and dress are minutely described, and in most cases some account is given of the ceremonies and customs on domestic occasions—birth, marriage and death—which form so interesting and characteristic a feature in their lives. In the case of aboriginal tribes or semi-Hinduized castes, very curious details are noted. A vivid—we might almost say photographic—picture of the Bengal peasant may be extracted from these volumes in which we find the minutest details of his life and work—the instruments with which he tills the ground and the cost of the cattle which he requires for that purpose. Not less carefully filled in are the details of the other sections of the work, and there is valuable matter in these volumes to suit all tastes. The portion of each District Account which will probably most interest our readers is the introductory one dealing with the geographical and physical aspects of the country. As readers of Dr. Hunter's *Orissa* will expect, much space is devoted in the introductory sections to the Rivers, which forms so important and striking a feature in the physical geography of Bengal. The general characteristics of the deltaic rivers are described with great clearness, and in each District Account we have first a general survey of the river-systems, line of drainage, &c., and then a detailed account of each river; a description of its bed and banks; the depth of water at different seasons of the year; and a history of the known changes in its course. As a good instance of the careful manner in which this whole subject is treated we may cite the excellent description in the second volume, of the difficulties experienced in keeping open the great Nadiyá rivers, the Bhágirathí, the Jalangí, and the Mátábhángá. If left to themselves, these rivers form enormous sand-banks and shoals, which render traffic impossible soon after the commencement of the cold weather. To remedy this state of things, the Government annually expends a large sum of money, recouping itself by the levy of tolls at Nadiyá and Krishnáganj. The history of the efforts made by Government to keep open these important channels of communication and the record of the difficulties with which it has to contend in doing so, are full of interest and exhibit in a very striking light the stupendous natural forces at work in the great Indian rivers.

It is, as we have said, impossible for us to review in detail this elaborate work; but, before bringing our notice of it to a close, we must express the great satisfaction and relief with which we notice the official introduction in a popular work of reference of a uniform system of spelling Indian proper names. These volumes, published under Government sanction, will do more to familiarize readers of all kinds with the simple system (for the establishment of which some years ago we have also to thank Dr. Hunter) than many Orders of the Governor-General in Council, and all Indian students have reason to be

grateful to the author and to the Government for setting happily and finally at rest that once-vexed question.

The *Statistical Account of Bengal* is in every sense of the word a great work, and the Government of India and of Bengal, not less than Dr. Hunter, are to be warmly congratulated on its successful completion. These Governments owe, we are convinced, a deep debt of gratitude to the Director-General of Statistics for the manner in which he has achieved a task which, we repeat, we think few men could have brought to a successful issue. We look with the greatest interest, and, we can now add, with perfect confidence, for the appearance of the new *Imperial Gazetteer of India*, on the preparation of which Dr. Hunter is at present occupied.

THE COUNTRY OF THE MOORS.*

MR. RAE gives us a narrative of his visits to the states of Tripoli and Tunis. Of the towns of Tripoli and Tunis there is not much that is new to be learned, nor can they be considered outside the influence of civilisation, inasmuch as the traveller will find the English Church service on Sundays, at the consulate at the former, and the latter town is approached from the coast by a railway, the time-table of which figures in *Bradshaw*.

The whole country visited by Mr. Rae positively swarms with ancient remains, and it is shocking to read of the uses to which antique columns are put. At Leptis, he says—"We ascended the hill, and found on its crest a gang of fifteen or twenty negroes, with a Maltese overseer, hard at work excavating. They had come upon the site of a temple, of which the noble red granite columns still stood erect under the sand. They had excavated a huge hole, and length by length the columns were being removed, and placed ready for transport to Homs. This disgraceful traffic is destroying what remains of Lebda's glories. Maltese and low Mediterranean traders in Homs are growing rich upon the sale of columns. They have been doing this since the beginning of the century; and unless some one interferes, future travellers will have to seek for the ruins of Leptis in the olive-mills of Tripoli, Sfax, Susa, and the other Barbary ports. Invaluable as olive-crushers, the shafts are being shipped wholesale, for sale to the oil-merchants."

Roman copper coins are so plentiful that they pass current in many of the bazaars for their equivalent copper value.

One pretty custom of the Moors of Tunis is new to us. Mr. Rae says that in dress and manners they show a grace and refinement not to be seen amongst other Moors, and that they have a general habit of wearing under the turban, and above the ear, a small bouquet, sometimes a couple of lovely rosebuds. This recalls Shakespeare's

> "That in mine ear I durst not stick a rose."

We recommend this coincidence to the commentators.

The really valuable part of Mr. Rae's book is the account of his visit to the sacred city of Kairwân. The fanaticism of its inhabitants has hitherto been supposed to render it dangerous for a Christian to enter within its walls. Our author, however, found no difficulty in doing so. Indeed, the ease with which he obtained permission from the Government, and the promise of an escort of soldiers to protect him, caused him *extreme disappointment:* he fills more than five pages with a description of the precautions he would have adopted had they been necessary. He was hospitably entertained by the Kaid of Kairwân, and in his walks through the town was attended by his escort: this saved him from any attack from the townspeople, who seemed very ready to annihilate any unprotected unbeliever. The great mosque of Kairwân is a building replete with interest. Fergusson, in his *History of Architecture*, writes:—"The Mosque of Kairwân is one of those buildings about which it would be especially interesting to know something." This *something* Mr. Rae now gives us, in the fullest account of the mosque which has hitherto appeared. He was able to take the outside measurements, and to make a careful plan of it. He did not venture to enter it, but the great doors of the courtyard and prayer-chamber being open, he was able to see the interior pretty clearly. There is much similarity in the plan of this mosque and that of Cordova, and both have the same court in front, which would seem to militate against Fergusson's suggestion that the court at Cordova was borrowed from the Christian basilica. Mr. Rae calculates the number of columns in the interior of the mosque to be 415: he tried to get a native to count them, but in vain, as a superstitious notion obtains that whoever counts them is held to be accursed. This does not seem to have been the case 150 years ago, for Dr. Shaw states that the natives told him there were no fewer than 500. Mr. Rae gives an etching from his sketch of the eastern angle of the mosque: we wish he could also have shown us the Minar.

* *The Country of the Moors: a Journey from Tripoli, in Barbary, to the City of Kairwân.* By Edward Rae, F.R.G.S., Author of "The Land of the North Wind." (London: John Murray. 1877.)

PERAK.*

THE Malayan Peninsula is a very interesting region, and a large extent in the interior and on the eastern coast is unexplored. It is divided into numerous petty kingdoms, and the greater part of the country is still covered by primeval forest, rivers affording the only access to the interior. On the western coast the principal native State to the north is Quedah, bordering on the British Province of Wellesley, including Pulo Penang. Proceeding southwards, the next State is Perak, then comes Salangore and the British settlement of Malacca, and lastly Johore.

There is an account of Quedah, written by Admiral Sherard Osborn in 1857. This is one of the most charming narratives of adventure, interspersed with life-like descriptions of scenery, that has been published for the last fifty years, and conveys an admirable impression of the most northern of the Malayan States. An account of Johore and of its enlightened ruler, by Mr. W. E. Maxwell, will be found in our number for September 1872 (p. 184); and an article on piracy in the Straits of Malacca, also by Mr. Maxwell, is in our number for January 1873 (p. 312).

Perak, the central Malay State, has found an able and thoroughly efficient historian in Major McNair. His work has the character of a monograph. He describes Perak as covering 4000 square miles, with 90 miles of coast and 45 of depth inland. The Perak river is the great fluvial highway intersecting the wide central plain from north to south. On the west side fertile lands extend to the sea, while to the east there is a gradually rising country to the central ridge. The Malay *campongs* or villages, consisting of bamboo houses embedded in groves of cocoa nut and fruit trees, occasionally with a mosque, are along the river banks, the interior being covered with jungle. Major McNair gives a very interesting *resumé* of ancient knowledge of the mineral wealth of the Malay peninsula, and describes the tin mining stations and gold washings.

* *Perak and the Malays—Sarong and Kris.* By Major Frederick McNair, Colonial Engineer and Surveyor-General of the Straits Settlements. Maps and Twenty-three Engravings, from Photographs; pp. 454. (Tinsley Brothers. 1878.)

Then follow chapters on the vegetable productions, including fruits, on the animals, and on the people, their manners and customs. There are also chapters on the Malay language, and on the history and government of Perak. The last chapters give an account of the murder of Mr. Birch, the British Resident, of the operations which ended in the death of that gallant and lamented young officer, Captain Innes, and of the subsequent events ending in the installation of the present Sultan Yusuf, with Mr. Low as Resident. The book is an exhaustive, and at the same time a very ably written monograph on a Malayan State of which our knowledge was formerly very deficient.

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THE INDIAN FORESTER. Vol. ii., Nos. 2, 3, 4; and Vol. iii., Nos. 1 and 2 (Oct. 1876 to Oct. 1877, inclusive). (Calcutta.)

SINCE we last noticed *The Indian Forester*, in our number for November 1876 (p. 308), five new numbers have been received, which fully maintain the useful character of the periodical. It has, under the able editing of Dr. Schlich, become a marked success. The number for October 1876 contains papers on the cultivation of the *Eucalyptus globulus* in India by Mr. O'Connor and Dr. Brandis: that for January 1877 is chiefly occupied with the consideration of the demarcation of forest areas, of supply and demand in their relation to working plans, and of the political value of forest conservancy, the latter important article by Mr. Baden Powell. The number for July 1877 contains a paper on the forests of the Tinneveily district, by Colonel Beddome, and one on working plans, by the editor.

In the number for October 1877 there is an account of the Conolly Teak Plantations in Malabar, by Mr. Atholl MacGregor, who was recently Collector of the district. It gives a history, from the commencement by Mr. Conolly in 1840, of these plantations, which are certainly the most important in India. Eventually they will contribute an immense stock of fine timber, and reimburse the State for the whole of its outlay, with interest. The paper contains full statistics of the plantations, and is illustrated by a map.

Cartography.

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Chavanne's Wall Map of Africa.*

DR. J. CHAVANNE, the able Secretary of the Vienna Geographical Society, has given us a most admirable physical wall map of Africa, which is the most recent and accurate one that we have yet seen. The heights are shown by graduations of colour from dark brown to green, the different shades representing differences of a thousand metres; the rivers are clearly and prominently marked and the topography generally laid down with that care for which German geographers are pre-eminently noted. We note that Stanley's latest discoveries are duly exhibited, but we question the compiler's right to show the "Alexandra Nyanza," the greater portion of the particulars of which were obtained from hearsay, as if it had been actually surveyed, and we must protest most strongly against the adoption of the term Livingstone, instead of the familiar Congo, for the giant stream which discharges itself into the Atlantic. The plan of conferring fresh names on rivers, islands, or other geographical features, which may happen to receive partial exploration at some one's hands, is one that will infallibly lead to great confusion; for there is no knowing where it will stop. On the same principle the first traveller who explores the Nile, from its most southern source, might consider himself justified in re-naming that parent of rivers. In the lower margin of Dr. Chavanne's map are smaller maps showing (i.) the river basins of the continent; (ii.) the distribution of forest, cultivated land, steppes, savannahs, and desert; (iii.) the ethnographical, and (iv.) political characteristics. It is altogether a most complete production, and we congratulate Dr. Chavanne on the appearance of a map which we trust may be the precursor of other similar maps of the principal divisions of the world. We must not omit to mention that the map is accompanied by a short explanatory pamphlet, giving a chronological list of all explorations during the present century, and an enumeration of the various materials on which the present map is based.

* *Physicalische Wandkarte von Africa.* Entworfen und gezeichnet von Dr. J. Chavanne. Maas-stab 1 : 8,000,000. (Wien, 1878, E. Hölzel's Verlag.)

Indian Land Survey Maps.

THE publications of the Indian Surveys appear with their usual promptitude, and include a vast amount of cartographical productions of an important character, some being executed with considerable taste. The Indian Atlas quarter sheets recently completed include Nos. 23 N.W. and 23 S.W. exhibiting parts of Kattywar, No. 130 N.W. (Brahmaputra river, Bisnath Jorhat and Golaghat in Assam). These are preliminary editions without hills, and call for no particular remark. Besides these are No. 124 S.E. (Kamroop, Nowgong, &c.) a remarkably good specimen of hill engraving, and No. 72 N.W. (Chindwara, Baitul and Nagpore) preliminary, without hills. Of the Punjab Revenue Survey (Bahawalpur State) sheets 28, 33, 39, 40 and 44; and of the Gurgaon District Revenue Survey, sheets Nos. 1 to 12 have appeared. The great deviations made by the River Indus are here graphically shown in the Bahawalpur sheets by dotted lines indicating the former course of the river. These are fairly good specimens of cartography, the delineation of the hills on the former alone wanting a little in clearness. Of the Bheerbhoom District sheets, Nos. 1, 2, 3 and 5 are published, and this completes the tale of the Revenue Survey sheets. The usual promptitude in the publication of the results of the surveys does not seem to have been observed in the case of the Bheerbhoom sheets, the survey having been made in 1853-55, and sheets 4, 6 and 7 being still due. The same remark is applicable to certain plans of cantonments and stations, viz., Seebsaugor, Kyouk-Phyou and Kooch-behar, though in these cases the need for the sheets was probably not urgent.

The Topographical Survey sheets are very numerous, comprising Nos. 58, 59, 62, 63, 64, 66, 67 and 73 of the curiously monotonous survey of the Rajputana sandy steppe-like country. The Bhopal and Malwa Survey is represented by sheets Nos. 19, 20, 21, 37, 39 and 37; and the Gwalior and Central India Survey, by sheets 76, 77, 79 and 80. The Ganjam and Orissa series is divided into two categories, the two-inch and the one-inch surveys. Sheets 20, 24, 33, 42, 43, 46, 48, 52, 69, 71, 73, 74 and 98 have been published, and the series will very shortly be completed. The Kattywar Survey (one inch to one mile) sends sheets Nos. 10a, 36, 37, 38 and 45 which are clearly and delicately drawn, and show most usefully all cultivated waste areas, and even footpaths. The Guzerat Survey, of which we have seen sections of sheets 14, 80, 81 and 82 is on a much larger scale (four inches to the mile), and is most elaborate and clear, showing as it does the fields with their fiscal numbers, village boundaries with the area and population of each. Of the Topographical Survey of Dehra Dun and the Sewaliks (on the same scale as the preceding one) sheets 25, 30 and 35 have appeared with an index map. The other publications of the Indian Surveys, useful

though they be, do not appear to call for detailed notice.

Indian Marine Survey Charts.

ALONG with the new report on the operations of the Marine Surveys of India there is an interesting Index map showing the surveys completed and in progress. The number of completed surveys are seven: Kolachel, Madras, Coconada, False Point, the Hooghly river, Rangoon river and Maulmain; the partial surveys are ten: Goa, Calicut, Cochin, Palk Straits, Pt. de Galle, Chittagong, Akyab, Kyouk Phyou, Tavoy and Kopah Inlet; the compiled charts twelve: the coasts of India from Karachi to Coconada (three general charts) south-west coast of Guzerat, Angria Bank and the Laccadivhs (five charts), Quilon roads. False Point to the Sand-heads and Junkseylon. There are also three general charts in preparation dealing with the whole coast of India and the Malay peninsula from Coconada to Pulo Penang. The index gives a good idea of the excellent work done by the Marine Survey Department since its establishment in 1875.

Log Book.

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Colonel Yule and Mr. Stanley.—In a pamphlet published by Colonel Yule and Mr. Hyndman, entitled, "*Mr. Henry M. Stanley and the Royal Geographical Society, being the Record of a Protest:*" our argument in defence of Mr. Stanley, in our number for March 1878, p. 53, is thus described. "That it would probably have been wrong in Mr. Stanley to shoot negroes on his own responsibility; but as he had got authority to do so from two gentlemen, A. B. of London and C. D. of New York, he was quite justified in doing so, provided he did not do it when he himself judged it to be unnecessary." A reference to our article will show that this is not a fair representation of our contention. We maintain that an explorer sent out into a lawless and savage country has a right to defend his life, and the lives of those for whom he is responsible, by force if necessary; whether he is employed by gentlemen of London and New York or not. We also maintain that such explorer is bound to refrain from using force except under circumstances of absolute necessity, and that of this, by the nature of the case, the explorer alone can be the judge. But we propose to discuss this question more fully in our next number.

Death of an Arctic Explorer.—We have to record the death of one of that gallant few which attained the highest northern latitude ever reached by man on the memorable 12th of May 1876. (For the names of the ten see our number for January 1877, p. 2). DANIEL HARLEY was born at Madras in 1849, he entered the Navy before the mast, was a seaman gunner, served in the Ashanti war, and was one of Commodore Commerell's gig's crew when he was wounded. In May 1875 he was selected for the Arctic Expedition, and became Captain of the Foretop of H.M.S. 'Alert.' He was away autumn travelling from September 11th to 14th, and suffered severely from the gale of wind and intense cold. But he soon recovered, and was full of zeal for the spring travelling, when he formed one of Captain Markham's sledge crew, in the northern division. Harley was one of the ten who planted the Union Jack in 83° 20′ 26″ N. Attacked by scurvy he still continued to struggle against the insidious disease, resolute to do his duty until he dropped. When unable to drag he refused to be put on the sledge, and managed to walk over the ground. Of all that heroic band none displayed higher qualities than poor Harley. On his return to England he joined the 'Eurydice' as a first-class petty officer, and was drowned when that ill-fated vessel went down off the Isle of Wight, on the 25th of March 1878. Daniel Harley was a fine specimen of a British seaman. He was married shortly before he sailed for the Arctic Regions.

Lieut. G. A. Giffard, R.N.—In our December number we gave the appointments of the officers of the Arctic Expedition, showing that all, below the rank of captain, were already employed on active service except Lieut. Giffard. That officer was appointed first Lieutenant of H.M.S. 'Pelican,' on the Pacific Station, on November 29th, 1877. Lieut. Giffard commanded the sledge party, which was auxiliary to Lieut. Aldrich, and which subsequently laid out a depôt for his return journey. He was absent from the ship for twenty days in the intense cold, from April 3rd to April 23rd, and again from the 7th of May to the 2nd of June. His second journey is important because it furnishes a part of that mass of evidence which refutes the conclusions of the Scurvy Committee. The Committee's conclusion was that the outbreak of scurvy among the sledging parties was due to the absence of lime juice. During Lieut. Giffard's second journey, at a time when it was possible to use it, daily rations of lime juice were regularly served out, yet two men were attacked with scurvy, and got daily worse and worse in spite of the lime juice. Lieut. Giffard also assisted Captain Markham with the magnetic observations.

Journey to Sana in Yemen.—Signor Renzo Manzoni has recently made a journey from Aden to Sana, and has published the particulars thereof in the *Esploratore*. Signor Manzoni left Aden in company with an Italian and an Englishman, Richard Howorth, of Liverpool, on the 20th of September last, and arrived at Sana on the 15th October, the distance traversed being $244\frac{7}{10}$ miles. Along this route Signor Manzoni made a careful survey on the scale of about 8 or 9 miles to the inch, which is reproduced in the February (No. 8) number of the *Esploratore*. According to his survey, Sana is situated in lat. 15° 15′ 30″ N. and 44° 34′ E. of Greenwich. Its height he fixes at 2130 metres above the sea. The population he gives as 15,000, 2000 of whom are soldiers and form the garrison. Signor Manzoni gives various other interesting particulars regarding the place in a series of letters which are appearing in the *Esploratore*.

Surveys in Shiraz and Khorassan.—Dr. Franz Stolze's explorations in March and April 1875, of the country lying south and south-east of Shiraz, forms the subject of a short article, in the *Zeitschrift* (No. 69-70) of the Berlin Geographical Society. The article is accompanied by a map, exhibiting Dr. Stolze's route survey, which is of value, as it lies through a region only imperfectly known to us, by the accounts of Dupré (1808), Ouseley (1811), and the English telegraph officers. Several noteworthy ruins were observed, particularly those of a fine temple in the neighbourhood of Firuzabad, and of a massive structure called "The Prison of Isfendiar," situated on a hill, between Fâsa and Dârâb and dating from the Sassanian era.

The same number contains a detailed account of a route between Semnan and Mash-had in Khorassan, by General A.H. Schindler, of the Persian Service. The General's instruments were, an azimuth with an English-make prismatic compass, an aneroid and a thermometer. His survey, which is reproduced on the scale of about nine or ten miles to the inch, runs by way of Damghan, Shahrud, Abbasabad, Sebzevar and Nishapur. It contains numerous heights and a good deal of new topographical detail, which will form fresh material for a new map of Northern Persia whenever such may be undertaken.

Survey Work on North-east Frontier of India.—The present season's survey work in India will probably add considerably to our geographical knowledge

of the north-eastern frontier. Lieut. H. J. Harman, of the Indian Trigonometrical Survey Department, has been deputed to explore the upper course of the Subansiri river as far as the first high range. Lieut. Maxwell ascended the course of the river for three or four days during the month of January 1877, and reports the Miris, who inhabit the country, as a quiet and peaceful people. Lieut. Harman also proposes to explore the gorge to the extreme east of the Assam valley, where the Brahmaputra valley debouches into the plains. A survey of the country between the Duhong and the Brahmakund is to be carried out by Lieut. Woodford.

Indian Coast Surveys.—The survey of Ratnagiri and adjacent bays (on the West Coast of India), has just been completed by Lieut. Jarrad, R.N. and party. The survey is an elaborate one, and has been charted on a scale of 4 inches to 1 nautical mile; and the topography and other shore detail, bordering on Kalbadevi and Ratnagiri rivers minutely mapped, in order that the great value of this port as a safe anchorage, during the south-west monsoon, may be more clearly demonstrated.

Now that Mr. Crawford, the collector of Konkan, has succeeded in obtaining sanction for the completion of the Amba ghat (over the Western ghats), Ratnagiri becomes of the greatest importance as an anchorage, as it will be placed in direct communication with the Dekkan, the road from it, *viâ* the Amba ghat, being the shortest and easiest, as it is almost dead straight from the coast. The Amba ghat, will in all probability be opened to cart traffic in 1879, and had it been so when the country was stricken by famine last year, seventy or eighty thousand tons of food grain, could have been landed in Kalbadevi Bay (Ratnagiri), and from it could have been transported to the remotest of the famine districts of the Dekkan.

Vessels at present calling at Ratnagiri during the fine season, anchor south of the fort off the town, but this is a dangerous anchorage, as that corner of the bay is studded with rocks, and during the south-west monsoon no boats can land there. The anchorage in Kalbadevi Bay, 4½ miles north of the town, is however, perfectly safe, and affords good shelter under Meria head-land during the south-west monsoon. A cart road is in course of construction, between it and Ratnagiri, so that goods landed there, can be easily and quickly conveyed to the town. Kalbadevi Bay, is in fact, an anchorage, which may be resorted to by vessels all the year round, an advantage it possesses over all the small ports of the Bombay Presidency, between Bombay and Carwar, with the exception of Viziadrug.

Both Viziadroog and Ratnagiri (Kalbadevi Bay), *the safest ports along the whole line of coast*, appear to have been overlooked in the various schemes of communication with the interior, which have been carried out during the past few years, although previously their importance had been fully proved. During the mutiny in 1857, Kalbadevi Bay and Viziadroog, were the principal places at which the steamers, of the Indian Navy landed troops, stores and treasure, but from ill judged schemes of communication with the interior, these ports have now little or no trade. The principal roads, from the Dekkan to so called ports, such as Vingorla, Malwan and Dioghur, &c., have monopolised the traffic, as they afforded the only routes for it. Yet both the former places are dangerous anchorages, even in the finest weather, and both are encumbered with numerous rocks. Dioghur is even worse, yet over 80,000 rupees were spent on a cart road to connect it with the interior. To show the use of this road, it will only be sufficient to say, that Viziadrug, with no road, sent 1,000 tons of grain to the Dekkan during the famine of last year, against 555 tons sent from Dioghur, with a cart road.

A direct route from Viziadrug, *viâ* Waghotan, was commenced years ago, but stopped for some extraordinary reason or other, and the above mentioned useless road constructed. The road *viâ* Waghotan, had only about 15 miles to be completed, when it was abandoned, now however, there are hopes of these mistakes being rectified. Seven-and-half miles of the Waghotan road were completed last year, as a famine relief work, and there only remains about the same to finish the Phonda ghat road. Had this road been opened, 20,000 tons, instead of 1,000 tons, would have been the famine contribution last year by the Viziadrug port, which would have been open all the year round.

The survey party under Lieut. Jarrad, will now be ordered to proceed to Viziadrug, and execute a similar minute survey of that port. The surveys of these really important anchorages when published will be valuable additions to the charts of the Indian Coast, as they will enable vessels to anchor in perfect safety there, and in the most convenient situations for transshipping goods, while from the largeness of the scales on which the surveys are charted, they may prove most valuable for any future harbour improvements.

Dr. Pogge's Itinerary from Kimbundo to Quizememe, in Western Africa is reproduced in the Berlin Geographical Society's *Zeitschrift* (Nos. 69, 70). Dr. Pogge crossed the Kassay, where it was 350 yards wide and 20 feet deep, and the Lulna which varied between 200 and 250 yards in width and between 16 and 20 feet in depth, The course of both lies to the north. His most easterly point was Inchibaraka, 8 or 10 days beyond which, to the east, is the Lubilash, which bears a different name in the southern (upper) part of its course. This he considers may be possibly identical with Cameron's Kuvari. The Lualaba river is well known in Quizememe. Lieut. Lux, Dr. Pogge's companion, adds the particulars of two routes, one 35 and the other 27 days in length, between Kimbundo and Quizememe (Mussumba). The information was derived from Saturnino, a native caravan trader. The first route appears to be nearly the same as that followed by Dr. Pogge.

Proceedings of Geographical Societies.

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ROYAL GEOGRAPHICAL SOCIETY.

Meeting of 25th February, 1878.

Armenia and Mount Ararat.

Sir Rutherford Alcock, K.C.B., in the chair.

The paper of the evening was by Mr. J. Bryce. "On Armenia and Mount Ararat. Armenia, he said, was perfectly undefined, and it was impossible for any geographer to lay down either a natural, political, or an ethnological limit in which geographers could acquiesce. Speaking generally it consisted of the upper valleys of the three great rivers Araxes, Euphrates, and Tigris, and occupied a lofty ground which lay round the sources and upper courses of these great streams. It also included three remarkable lake basins—the basin of the Gokcha Lake, which discharges itself into the Araxes, and the lakes of Van and Urumgah, which receive streams but discharge none, their surface being reduced by evaporation. These, Mr. Bryce went on to say, were the dimensions of Armenia,—about 400 to 500 miles each way. The country he described as very barren, and of great elevation, no part being less than 2500 feet above the level of the sea, and the climate was extremely dry and hot in summer and intensely cold in winter. Armenia was divided between three empires: the greater part, including the whole southern and western portion belonged to Turkey, the south-eastern to Persia, and the portion lying between Lake Gokcha and the

Turkish borders to Russia. The people inhabiting the country were various, the indigenous people being the Kurds. The total number of Armenians in the world was estimated at between four and five millions, one half of whom, Mr. Bryce was of opinion, resided in Armenia proper. They were short of stature, quiet and mostly given to agriculture; but out of their own country were quite a different people. The Kurds were a great contrast to the Armenians in most respects; they were extremely stalwart, and rather inclined to be short than tall, with black hair and small fierce eyes. Besides these a considerable population had from time to time flowed in from the east and north, and Circassians had settled in north-western Armenia round about Kars and Ardahan. Nearly in the centre of this country rises the great Mount Ararat, which was next touched upon by Mr. Bryce. The mass of Ararat was about 25 miles long from north-west to south-east, and from 12 to 14 wide, the total circumference being from 70 to 80 miles. It consisted of two peaks joined to one another by a sort of neck. The greater of the two, or Great Ararat, rises to 17,000 feet above the level of the sea, and 14,500 above the Araxes, while Little Ararat was about 12,800 feet above the level of the sea. Both were of volcanic origin, and were separated by a depression averaging in height from 7000 to 8000 feet. There was no permanent settlement or village anywhere upon the skirts, except on the north-eastern face, in the direction of Aralykh, where there was a small village, inhabited by Tatars. From this place, in September 1876, Mr. Bryce, in company with a friend, made his ascent of the mountains. At a height of about 11,500 feet, his friend, not being in trim for mountain climbing, left him, and Mr. Bryce proceeded with a Cossack and Kurd. The upper part of the mountain was perfectly bare either of snow or vegetation. Large beds of snow were running down for a great distance from the top, to a height of 11,000 to 12,000 feet, which one had to ascend, or else along slopes of bare, loose, broken stones. The latter course Mr. Bryce chose. At a height of 15,000 feet, the Cossack and Kurd refused to go any further, so he was compelled to journey alone. The last part of the ascent was upon a slope of rotten rocks, rather soft and sulphurous, which crumbled away from under his feet, and therefore gave an extremely bad hold, which proved very fatiguing. Near the top of this long slope Mr. Bryce could just discern the edges of the plateau of snow, and hanging on this a curtain of clouds. After getting on the snow and into the clouds, and walking for about five minutes, two strong blasts of wind swept away the clouds, and then a wonderfully grand and extensive view lay before him. The Caucasus could be seen to the north, a distance of about 250 miles; the highest ranges of mountains round Erzeroum to the west; the mountains of Assyria, South Kurdestan, the mountains in the direction of Nineveh, and the valley in the direction of the Zab, to the south; to the east, the enormous mountain masses in Persia, and north, as far as the Caspian.

Mr. Bryce felt greatly relieved in having accomplished the object of his enterprise; but was much disappointed in finding no fragments of the Ark. Finding a shorter way down, he succeeded in joining his friend just before sunset, and next day they made their way homewards. Mr. Bryce is of opinion that the Armenian nation, its prospects, history, position and its character, had hardly received sufficient attention from the English public. He considers the Armenians by far the most hopeful and vigorous race in the East, and one which had retained its national character, its individuality, and its faith through a thousand persecutions and a thousand wars. It was a race which now showed extraordinary aptitude for commerce, and also for the work of civil government, because the large majority of Russian, and a very large proportion of Turkish officials belonged to the race, and were said, even by the Russians themselves, to make better administrators than the Russians.

In the discussion which followed, Sir HENRY RAWLINSON, who had been more or less connected with Armenia during forty-five years, was glad to bear testimony to the value and correctness of Mr. Bryce's observations.

A vote of thanks was proposed by the PRESIDENT, and the meeting then adjourned.

Meeting of 11th March, 1878.

MAGNETISM OF THE EARTH.

MR. F. GALTON, F.R.S., in the chair. Captain F. J. EVANS, R.N., C.B., F.R.S., Hydrographer to the Admiralty, delivered a lecture on "The distribution and direction of the Earth's magnetic force at the present time: the changes in its elements, and on our knowledge of the causes." The lecturer commenced by describing the mariner's compass and referred to the discovery, about three hundred years ago, of the peculiar properties of the magnetic needle. He explained the two elements of *dip* and *variation*, and stated that Dr. Gilbert, of Colchester, physician both to Elizabeth and James I. published a Latin treatise "On the magnet (or loadstone) and magnetical bodies and of that great magnet, the Earth." During the seventeenth century our seamen diligently made observations at sea of the dip and variation of the compass. Towards the close of the century, Halley presented two papers to the Royal Society on the subject of the variation of the compass, and after a voyage of research compiled a magnetical chart for the Atlantic and Indian Oceans. But as he was sorely perplexed as to the true cause of magnetic forces and disturbances he appealed to all navigators to aid in accumulating observations on the subject. His appeal was not in vain, and the Norwegian magnetician, Hansteen, compiled a series of magnetic charts for different epochs ranging between the years 1600 and 1787. The voyages of Ross, Parry and others to the Polar Regions, passed near the magnetic pole, where the dipping needle stood vertical, and in 1831, James Ross discovered the North Magnetic Pole. Gauss gave great impetus to the study by his researches, and "Magnetic Storms" were soon detected. Observations were established in various parts of the world, and to Great Britain fell the task of collecting observations in oceanic regions. In 1843 James Ross's expedition returned after having attained the high dip 89°, being very near the South Magnetic Pole. Sir Edward Sabine closely analysed the results of observations, and his researches formed a solid and endurable foundation for future enquiries.

The lecturer then entered at length on the characteristic features of magnets, on the compass and dipping needles.; on the "Lines of Force" over the globe, and the distribution of magnetic force over the earth's surface. He also enlarged on the nature of terrestrial magnetism and its distribution, and on the continual state of change of which magnetic elements are susceptible. Having touched upon the action of the sun and its position upon the magnetic needle, he dealt slightly with the perplexed subject of the disturbances of the latter, and their probable connection with auroras and earth currents. The lecture concluded with a reference to the greater magnetic changes, known as secular, and certain hypotheses concerning them.

NOTICE.

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PREJEVALSKY'S ROUTE

FROM

KULDJA ACROSS THE TIAN SHAN

TO

LOB NOR & THE ALTYN TAG,

1876 & 1877.

Scale, 1:3,000,000.

Russian Versts (104·8 = 1°)

Kilometres (111·2 = 1°)

Heights in English (Russian) Feet.

Marsh. Sand desert. Pass. Salt Marsh. Spring.

Astronomical positions.

Forest and Brushwood.

82 83 84 85 86 Longitude E. 87 of Greenwich 88 89 90 91 92

44 43 42 41 40 39

Kuldja Depart 12th Aug. 1876

Ili. Chargalak Kach Aksu Ili. Aral Tau Kunges Yamatu Chon-kuli Waterfall Zanma Yekes Narat Pass Yermin-ulu Lesser Tian Shan Greater Yuldus Tian Shan Gebirge Chabin-tura Charaul-tal Chaidagol Karashar Bagratah Kul (Dengis) according to Wilken Chikchin Korla Kuruk Tag Bash-inis Shanyga Konche Daria Ugen Daria Tarim Inschikl Kotal Hutmei-kul Achiarma Tais-kul Kukuia Daria Markat Ulmagul Kul-uler Daria Airgan 10 Dec. 1876 Sand-hills extend to the South-West as far as Kiria. Lob Nor Kara Koshun = Chol-kyk i.e. Greater fresh Lake Kara Kurtchin Kara Buran i.e. Black Storm Ruins of the City of Lou-lan Kum Tag Sandhills as far East as Sha-chow This desert is the chief resort of the wild Camels Salt marshes alternating with Sandy deserts in this direction To Cherchen 11 days journey about 300 versts Altyn Tag. 13-14000 Plateau 50-60 Versts broad about 13000 feet high. Southward of this range there lies a plain 40 versts wide, beyond which is the high Chamen Tag range covered with perpetual Snow. Both ranges run parallel to the Altyn Tag westwards as the back of the town Cherchen as far as the Snowy Tiu, the Dabani mountains which appear to be the northern face of a high Plateau and runs as far as Kiria and Khotan

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